

10.7.1.6 Water Quality of River Stretch

BOD of Annapurna Ghat were studied. It indicated that BOD value has increased in only six (06) occasions out of forty (40) occasions in the table given below. The BOD value which indicates organic load generally increases due to the waste generated from the activity of the residents in the form of domestic household waste through different drains and channels. This incidental exceedance may be due to draining off untreated city sewage through four major drains into the river as the BOD load of the Ranga Khal and Singir Khal is observed to 54 mg/l and 48 mg/l respectively. Assam is cursed with the catastrophic flood every year and hence the BOD load also vary due to additional organic matter introduced in the river as a result of continuous rainfall during this disastrous calamity. Hence this exceedance can be considered as incidental and can be omitted from the polluted river stretch. Moreover, this marginal exceedance of BOD level does not reflect the extremity of pollution. The Annapurna indicates organic load generally increases due to the waste generated from the activity of the residents in the form of domestic household waste through different drains and channels. This incidental exceedance may be due to draining off untreated city sewage through three major drains coming from the Badarpur circle.

Table 201 BOD value in mg/l of Barak River at d/s of Annapurna Ghat for the year 2016-19

Year	BOD	Year	BOD	Year	BOD	Year	BOD
2016		2017		2018		2019	
Jan	2.8	Jan	2.3	Jan	2.1	Jan	2.0
Feb	3.9	Feb	2.5	Feb	2.0	Feb	2.0
Mar	1.6	Mar	2.1	Mar	1.3	Mar	2.0
Apr	1.1	Apr	1.1	Apr	2.4	Apr	2.0
May	1.6	May	1.8	May	2.0		
Jun	1.1	Jun	2.0	Jun	2.1		
Jul	4.0	Jul	2.8	Jul	3.2		
Aug	3.8	Aug	2.6	Aug	2.2		
Sept	1.8	Sept	2.1	Sept	2.2		
Oct	2.0	Oct	2.2	Oct	2.1		
Nov	1.5	Nov	2.1	Nov	2.2		
Dec	4.0	Dec	2.1	Dec	5.5		

10.7.1.7 Drains Contribution to Pollution

The river with a total length of 900 km from source to mouth drains an area of 52,000 sq. km. In India, the river traverses a distance of 532 km upto the Indo-Bangla border.

The Silchar urban area lies on the bank of Barak River. The River flows north to south beside the Silchar urban area. The khal system of this area is quite diverse and is spread throughout the city. There are three major khals named Rangirk-Khal, Singhir-Khal and Longai-Khal.

Rangirkhal is a water canal/khal which is 15km long. It starts from Mohisabeel, which is in Berenga and extends upto Ghagra River, which is in Banglaghat. It is an important natural canal to carry rain water from various places of Silchar town. The canal is as such that it carries water all through that flows within the periphery of this 15km. This canal serves as the main stream canal is flowing out waters that can cause



Rangirkhal, Silchar

urban floods and also that can inundate local roads and houses to great extent. The other two Khals named Singhir-Khal and Longai-Khal are almost 2km long and carries water through some major sections of the city.

There exist few lined and unlined drains within the urban area. These can drain some local areas of the urban area. The capacity and outfalls of existing drainage system is not planned with well-defined consideration of drainage areas/zones for the whole urban area. The lengths of existing lined and unlined drains are about 8.79 km. In absence of planned and adequate drainage system, the Urban area in places suffer from drainage congestion and water logging after heavy rainfall.

The main concerns for drainage issues of the Urban area can be summarised as:

- a) undersized drains,
- b) obstructions in the drainage system to outfall,
- c) damages of drains,
- d) inappropriate / temporary location of outfalls,
- e) absence of planned and systematic drainage network system.

There are industrial units observed with infrastructural facilities (ETPs, STPs) in the periphery of the polluted stretch of Barak river at down stream of Annapurna Ghat, Silchar along with few small scale industrial establishments.

Four major drains are identified in the Silchar sub district, which is responsible for draining off majority of the municipal, industrial and commercial waste from the Silchar town to the river (Table 202). Out of these drains, khalsrangirkhal and singirkhal carries most of the municipal sewage originated from domestic households.

Table 202 Major channels/drains of Silchar town contributing to the pollution load of the river

Sr. No.	Name	Description
1	Rangir Khal	The length of the Rangir Khal is 16 kms (approx.)
2	Longlai Khal	-
3	Singir Khal	The length of the Singir Khal is 500 m (approx.)
4	Bachai Khal	-

The drains mainly carry industrial as well as residential wastes. Direct dumping of residential and commercial garbage into the channel is making it shallower and heavily silted. As a result, during rainy season water overflows and inundates the areas. It is also observed that the drains of the town are also becoming a regular garbage-dumping site. Moreover, these drains are not planned properly to carry even the regular water.

10.7.1.8 Ground Water Quality

The quality of ground water in the Silchar is suitable for both the drinking and irrigation purposes except with higher concentration of iron (Fe) in the range of 0.05 to 5 ppm is observed in Kabaganj, Ujjan, Tarapur, Paila pool, Sadin bazaar, Dayapur, Dwarbond, Panibhora, Rangpur, Phatimora, Chandighat T.G. and Durgakona areas. Iron concentration in deeper aquifers is comparatively much lower than the shallow aquifers and it ranges from 0.3 ppm to 1.3 ppm. The content of iron in ground water ranges from 0.10 to 1.70 ppm and observed in few pockets of the northern part of the district.

The following remedial actions will be taken in consideration of contaminated ground water sources, controlled ground water extraction and periodic quality assessment.

- Ground water of deeper aquifers should be analyzed for periodic assessment of element like Arsenic, Fluoride, Iron etc.

- Alternate sources of drinking water should be explored and prioritized
- Role of pesticides used for agricultural activity should be carefully observed.
- Effective management of industrial effluent or sewage for preventing contamination of ground water sources.
- The industry that will extract groundwater for manufacturing process should not operate unless they possess valid permission for groundwater extraction from Central Ground Water Authority.
- Roof top rain water harvesting techniques should be encouraged for industrial, commercial or individual households and community.

10.7.1.9 Barak River Flood

The Urban area lies in the Barak River basin. The water level gauging in close vicinity of the urban area is from Barak River. Barak River is adjusted for Urban Area and only extreme cases of rainfall can cause flood through the rise of water in Barak River. But the average year flood level at the Urban area is somehow consistently increasing. It is assessed that 40% of land of the Urban area is above the average flood level. The rest of the land ranges from moderate to very deep flooding. It is assessed that 6%, 18%, 10%, 10% and 6% of land is subjected to moderate (30-90 cm flood depth), deep and very deep (90-150 cm flood depth) flooding in reference to average year flood.

The city receives runoff from both of the tributaries of Barak river Basin namely Katakhal and Sonai. The area is most flood affected region resulting in various types of erosion. Water logging is also the major issue in the Urban areas. Inundation occurs in some localized places of the urban area after heavy rainfall in absence of appropriate drains and routes. Presently mentionable water logging is observed following moderate to heavy rainfall in and in the vicinity of ward no.9, 23, 22, 21. The depth and duration of inundation vary from place to place. Such areas are freed from inundation by the process of evaporation and infiltration. Due to blockage in the three khals most of the urban flood occurs in Silchar city. The Rangir-Khal is a long canal and



Ranga Khari Junction

it flows through a greater area and due to overflow of this canal urban flood occurs in areas like Rangirkhari, Ashram Road, College Road, etc. Due to the other two Khals named Singhir-Khal and Longai-Khal some other areas like public school road, sonai road, radha-madhab road and some other areas are inundated during rainy seasons. The reasons for inundation/water logging are technical, social and institutional. These water-logged areas have been considered and should be brought under proposed drainage network. The logged water becomes polluted with solid waste, silt and contaminants that are washed off from roads. The increase in volume and rate of logged water causes erosion and siltation. It becomes a burden for the inhabitants of that urban area, leading to unhygienic environment and creating adverse effects on social, physical, economical as well as on environment. Over the last five years the huge boundary of this Rangirkhal canal has reduced marginally with reference to both its length as well its breadth. This reduction is not due to any natural cause but it is actually due to the human encroachment in and around Rangirkhal. People have inhabited their livelihoods across the boundaries of Rangirkhal, thereby reducing and pushing its boundaries inside. Houses, shops and other constructions have been made on this boundary which has been reducing the boundary continuously.

10.71.10 Flood Mitigation

The issues were studied and then a detailed probable way was figured out. Considering the above all factors, DDMA, Cachar has issued an order as per relevant sections of DM Act 2005 for eviction and de-siltation of Rangirkhal and Singirkhal etc. and accordingly the work has been started and after completion of 50% works the premonsoon rain started from 29th March 2017 and inundated many areas of the city and also the people of this city witnessed the improve water carrying capacity of the Rangirkhal. Sri S. Viswanathan, IAS, Deputy Commissioner cum Chairman, DDMA also visited many inundated areas of the city and seen how mitigation works reflects during the real-time scenario.

Every year the city of Silchar suffers a lot due to urban flooding. After the evacuation drive started it was noticed that a significantly less amount of effect was noticed. Less amount of inundation was observed, and the areas inundated were also not stagnant for a longer period. This change that came though it could not completely solve water logging process, but it has certainly reduced its impact. This is only because the water canals/khals were removed of blockages and this helped in free flowing of the water. Had these waters not been able to flow through these khals more disastrous effects would have been experienced by all the inhabitants of the district.

The relatively low lying area of the urban area is flood affected from internal rain feed. This is mainly due to blockages and unavailability of proper drainages. Here they can say that non-implementation of land use plan has caused all such ambiguities. There exist few lined drains within the urban area. They are much unplanned and lack in systematic drainage network. Some localized places of the urban area suffer from inundation due to internal storm water drainage congestion, and water logging in few places in absence of adequate gravity drainage provision and routes and also for choked up with solid wastes. After the absorption of the mitigation measures in the real process changes have positively been noticed and ill-effects of water logging have been reduced. Thus, Lack in social awareness is a huge concern for smooth functioning of the same and disaster management should be a part and parcel of every one's life where each one needs to be socially aware that what harm he is causing to the nature and the mankind. (Source: Cachar govt. Urban flood Case study)

10.7.1.11 Waste Management Plan

Table 203 Waste Management Plan

Sr. no.	Type	Status	Proposed actions	Authority
1	Industrial Waste	<ul style="list-style-type: none"> No industrial waste dumped on land or discharged into water bodies/river. Industrial wastes are managed by industries itself Authorisation have been granted to different industries in line with Water act 1974, Hazardous Waste (Management, Handling and Transboundary Movement) Rule, 2008 as amended. Regular monitoring by PCBA to ensure that the terms and conditions are strictly adhered in accordance with the prescribed standard 	Direction issued to the industries to identify the non-point sources and arrest contamination of storm water.	Pollution Control Board Assam
2	Municipal waste	<ul style="list-style-type: none"> Dumping is carried out unscientifically in the open space. No proper segregation of dry and wet waste No proper segregation of bio-degradable and nonbiodegradable waste Lack of unscientific disposal facilities/infrastructure technology like decentralized composting or bio-methanation plant, waste to energy plant, solid waste management plant. 	<p>Municipal Body is in process of inducing the following activity</p> <ul style="list-style-type: none"> Implementation of segregation of waste at source Door-to-door garbage Collection of waste Formation of Sanitation task Force Formation of Neighbourhood Community Awareness campaigns Processing and disposal of waste 	Municipal Body
3	Plastic Waste	<ul style="list-style-type: none"> Dumping is carried out unscientifically in the open space along with the municipal waste. No proper segregation of dry and wet waste No proper segregation of bio-degradable and nonbiodegradable waste Lack of unscientific disposal facilities/infrastructure technology like decentralized composting or bio-methanation plant, waste to energy plant, solid waste management plant. 		Municipal Body/ Pollution Control Board Assam
4	Hazardous Waste	<ul style="list-style-type: none"> Hazardous waste are managed by hazardous waste generating industries itself by disposing the same through authorised recycler, secured landfill area, Bioremediation etc. PCBA has engaged collection centre for collection of Hazardous waste Lack of TSDF facility for commonly utilization by hazardous waste generating industries 		Pollution Control Board Assam
5	Biomedical Waste	<ul style="list-style-type: none"> Segregation at the source under Biomedical waste Management Rules, 1998 as amended The HCFs have installed ETP for treatment of liquid waste generated 		HCF units/ Pollution Control Board Assam
6	E-waste	<ul style="list-style-type: none"> Most of the e-waste generator have sent their e-waste to their respective manufacturer. Annual return in (Form-3) is submitted by E-Waste generating units to PCBA from time to time for onwards transmission to CPCB There is no authorised recycler, refurbisher, dismantler etc. available to ensure environmentally sound management of Ewaste. There is no "facility" wherein the process of dismantling, recycling, and disposal of ewaste are carried out. Most of the e-waste generator sent their e-waste to their respective manufacturers 		Pollution Control Board Assam

(Source: Pollution Control Board Assam, Conservation of River Barak, Silchar)

10.8 FLOOD PLAIN LAKE

10.8.1 MAHISA BEEL

Floodplain lakes (locally called 'Beels') encompass a vital constituent of aquatic wealth of India. These are naturally saturated, low-lying swampy areas which are very resource rich ecosystem, have high ichthyological potentiality and allied agricultural production. It contributes a total of 0.20 million ha in India and in North-Eastern region 0.12 million ha to the aquatic system.

The Mahisa Beel is situated in Bhagadhar, Berenga Pt II, in southern part of Silchar town. This beel is known for plankton and other aquatic species which adds to environmental values. And the major species among these plankton is Zooplankton. It supports the significant fish culture, which are amply prolific in extensive approach. The principal resources for fish production in 'Beels' or any aquatic bodies are directly proportional to the plankton abundance predominantly the zooplankton availability. Its assortment, allocation, profusion and discrepancy in the biotic factors give knowledge about the energy turnover in the aquatic systems as they play a key role in cycling of organic materials, influencing all the functional aspects such as food chains, food web and cycling of matter of an aquatic system the biodiversity of zooplankton in a floodplain lake of the Barak valley, Assam with special reference to the general nature and composition of the taxocenosis, biogeography and ecology as well as to their species affluence and community structure within the water body.



10.8.2 ISSUES AND REQUIREMENT

10.8.2.1 Key elements to Encounter

- Degradation of water bodies
- Construction on riverbed
- Garbage dumping
- Eutrophication remediation from waterbody surface

Issues: Several anthropogenic activities which include agricultural and construction of buildings have created tremendous pressure on waterbody environment which leads to threat upon water ecology. In this way this waterbody environment is being degraded day by day and several types of flora and fauna are extinct from the Mohisa Beel. In the northern most part of the beel mostly falls in urban environment and in this part, waterbody has been shrinkage.

Requirement: For wise use of waterbody resources, it is very important to assess the impact of socio-economic factors upon the waterbody environment in regards of management plan. For proper management of waterbody resources several Steps should be taken to protect the waterbody from encroachment and strict law should be implement for their protection to illegal encroachment. Alternative means of livelihood should be generated for the people who depend upon waterbody resources for their survival. It will reduce the exploitation of waterbody resources and killing of fish and fauna. In Mahisabeel large part of the area covered by water hyacinth is facing a major problem. The eradication of weeds from the waterbody on a regular basis should be taken so that it may increase nutrient status and phytoplankton productivity. This will help to increase fish productivity. Efforts should be made to educate the local people and create awareness about the importance of management and conservation of this waterbody. Successful management of waterbody resources depends upon how properly concern authorities adopt appropriate plan and in what way it should be implemented.

a. Eutrophication Remediation

Run-off from agricultural fields, refuse and sewage, domestic wastes like food remnants, soaps, detergents, and sewage are dumped into lakes which break down and release nutrients in the lake. Microscopic organisms ingest these nutrients and survive on them. Following ingestion of carbonic elements, carbon dioxide is released, while some of the elements are converted into nitrates and phosphates. This is called oxidizing and uses up a lot of dissolved oxygen. The depleted levels of dissolved oxygen in water lead to a situation where other aquatic life-forms cannot survive. This process is called eutrophication.

Table 204 Effects of Eutrophication and Benefits of Removal

Effect of eutrophication	Benefits of reducing eutrophication	How benefits can be measured
Increased taste and odor problems in water supply	<ul style="list-style-type: none"> Lower costs of treating water Less need for substitute water (e.g., bottled water) 	<ul style="list-style-type: none"> Treatment cost savings Increased consumption of water and differential between prices of substitutes and municipal supply
Reduced visual and tactile qualities of water body	<ul style="list-style-type: none"> Increased development around water body Increased recreation More diverse biota 	<ul style="list-style-type: none"> Increased value of properties Increased development of land Increased expenditures on recreation Prices for different species caught Public WTP for improved ecosystem
Increased possibility of toxins in water	<ul style="list-style-type: none"> Increased commercial and recreational fishing More diverse biota Increased water contact 	<ul style="list-style-type: none"> Increased number and value of fish caught Public WTP for improved ecosystem Increased expenditures on recreation
Loss of water depth, surface area, and storage capacity	<ul style="list-style-type: none"> Reduced need for alternative water supplies Values of shoreline property preserved Continued viability of fisheries Continued viability of recreation 	<ul style="list-style-type: none"> Avoided costs for dredging and substitute water supplies Avoided losses in property values Value of fish catches, which would not have taken place Recreational expenditures which would have been lost Public WTP for existence of lake, apart from use values

10.9 PROPOSED STRATEGIES FOR RIVER

10.9.1 KEY ELEMENTS TO ENCOUNTER

- Slum Settlement around the river
- Polluted drains contributing to the river
- Solid waste dumping around river

The conservation of the River is an important goal for the Silchar town. To achieve this goal, in a sustainable manner, several actions are necessary. These actions focus on addressing pollution from the major sources – raw domestic sewage and MSW – and improving the hydraulic conditions. Actions are also proposed to provide human use benefits for the citizens of Silchar. By providing these benefits, and connecting people to an improved waterway, the stewardship of the river can be shared by all and achieve lasting conservation success.

10.9.2 PROPOSED ACTIONS THAT COMPRISE THE RESTORATION SOLUTION

To remain consistent with the framework, the proposed actions which comprise the restoration of the River and its drains include:

- Greenery Development – Plantation plan
- Sewage collection and treatment.
- Setting of Effluent Treatment Plant
- Solid waste collection and management.
- Hydraulic improvement (including uptake of water from the Barak River)
- Improving hygiene and sanitation conditions.
- Community access and benefits.
- Setting of monitoring system.

Each of these actions is described in more detail further:

- **Greenery Development** – Plantation plan: State Government has initiated afforestation in the degraded forestland, also raising roadside plantation besides creating check dams/embankments in the river catchment areas to combat erosion and soil conservation. The following remedial actions has to be initiated in consideration of greenery development.

1. Raise plantation along the riverbank to control the flow runoff water directly to the river
2. Bamboo species to be raised as it is a good soil binder thereby stabilize the banks of the river from erosion

- **Sewerage collection and treatment:** Presently there is no centralized sewerage collection and treatment facility in Silchar largely because most households have either a septic tank or soak pit. A new sewage collection system is proposed to collect all sewage and transport it to a centralised place for treatment. The system, if properly implemented, will significantly reduce pollution loads to the river. Another option which may be considered is to have multiple decentralized STPs located at strategic locations throughout the catchment area. This option will be evaluated in the Feasibility Report.
- **Setting of Effluent Treatment Plant:** It should be observed that none of the small-scale units of the

identified polluted stretch discharge their effluent directly into the river stretch as they have to captive ETP for treatment of their effluent. Moreover, the Board has to issue direction to build their own set up in their premises which do not have STP/ETP.

- **Solid waste collection and management:** As the Silchar town does not have any existing solid waste collection and management plan, it is proposed to have an Integrated Solid Waste Management Plan for the catchment area, which will also cover the entire town. As the town will implement a MSW collection and management system, waste will be collected from primary and secondary locations, and transported off-site to a disposal or reclamation facility. This system will require many years to become effective as the population learns to use and value the system over current litter and dumping practices.
- **Improving hygiene and sanitation conditions:** A number of community toilet complexes are required in slum area along the river. Solid waste collection bins and proper washing and bathing facilities are required at slums along the river.
- **Community access and benefits:** One of the keys to river conservation success is to provide human connections to the waterway. When these connections are established, everyone becomes a steward of the river and the restoration will be more likely to succeed. Examples of community benefits include the establishment of greenways along the waterfront and points of interest to educate the community on conservation features and ecological resources.
- **Setting of monitoring systems:** An on-line system can be designed and proposed to be implemented to monitor the water flow as well as water quality of the Barak River system. The on-line information will be used by decision makers to avoid flooding in the town.

10.9.2.1 Treatment and Disposal of Septage

Some of the households in the towns are equipped with ordinary septic tanks. Under the Swachh Bharat Abhiyan, Public Health Engineering has constructed 5893 numbers of IHHL in the Silchar district to attain open defecation free status. Moreover, public toilets have also been constructed at the commercial areas.

Following remedial actions will be taken in consideration of treatment and disposal of sewage .

- Sewage Treatment plant should be installed for treatment
- The discharge should be trapped by strainers before draining off to the river.
- Every individual households should be connected to sewer lines.
- Every households should be recommended to have individual drainage that should be connected to soak pits or stagnated pool.
- Roadside hotels/restaurants should not be allowed to dispose untreated sewage and solid waste into the nearby drains or rivers. These establishments should be properly regulated by the concerned authority.
- Public awareness to control open defecation and understand the sanitary hygiene.
- Local administration should provide proper pucca toilets for the individuals or atleast community toilets through the IHHL scheme under Swachh Bharat Mission.

10.10 POLLUTION

10.10.1 AIR

Alarming rate of urbanization, coupled with exponential change in demographic set up all over the globe are bringing about profound social and environmental changes. North-Eastern states of India in general and Barak Valley districts of Assam in particular are no exception to this. Contamination of ambient environment is of growing concern in urban as well as in the rural areas of the valley. Particulate Matter refers to the particles, dust, mist, fumes and smoke that become airborne in surrounding air. The standard laid down by CPCB for the Industrial and mixed area is 500 $\mu\text{g}/\text{cu mm}$, for residential area it is 200 $\mu\text{g}/\text{cu mm}$ while for sensitive area it is 100 $\mu\text{g}/\text{cu mm}$.

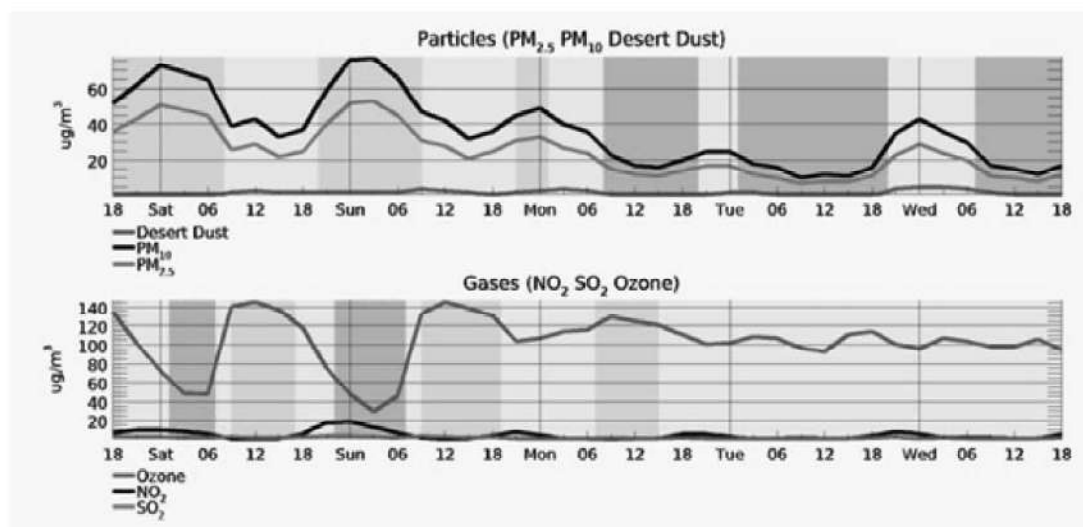


Figure 173 Particles and gases composition in the Air

The Figure shows the forecast of particles (PM and desert dust) for Silchar. Atmospheric particulate matter (PM) are microscopic solid or liquid matter suspended in the air. Sources of particulate matter can be natural or anthropogenic. Of greatest concern to public health are the particles small enough to be inhaled into the deepest parts of the lung. These particles are less than 10 microns in diameter (approximately 1/7th the thickness of the a human hair) and are defined as PM10. They are a mixture of materials that can include smoke, soot, dust, salt, acids, and metals. Particulate matter also forms when gases emitted from motor vehicles and industry undergo chemical reactions in the atmosphere. PM10 is visible by eye as the haze that we think of as smog. PM10 are among the most harmful of all air pollutants.

- PM10 can increase the number and severity of asthma attacks
- PM10 causes or aggravate bronchitis and other lung diseases
- PM10 reduces the body's ability to fight infections
- PM10 includes fine particulate matter defined as PM2.5, which are fine particles with a diameter of 2.5 μm or less. The biggest impact of particulate air pollution on public health is understood to be from long-term exposure to PM2.5:
- PM2.5 increases the age-specific mortality risk, particularly from cardiovascular causes.

Desert Dust consists of particles smaller than 62 μm originating in deserts. Often, the dust particles are small, leading to high concentrations of PM10 and PM2.5 and all related health impacts.

Forecasts of concentrations of air pollution gases are presented in the third panel. **Ozone (O_3)** pollution in

the lower troposphere is caused mainly in urban areas. Ozone pollution can make it more difficult to breathe deeply and vigorously.

- Cause shortness of breath, and pain when taking a deep breath
- Cause coughing and sore or scratchy throat
- Inflammation and damage the breathing airways
- Aggravate lung diseases such as asthma, emphysema, and chronic bronchitis
- Increase the frequency of asthma attacks
- Make the lungs more susceptible to infection
- Continue to damage the lungs even when the symptoms have disappeared
- Cause chronic obstructive pulmonary disease (COPD)

(Source: Silchar metablue, Airquality)

10.10.2 SOIL POLLUTION

Silchar is the gateway to the nearby states of Mizoram and parts of Manipur. The amount of municipal waste generated in the town is about 100 tons per day (CPCB 2011). The dumping area of Silchar municipality is located at Meherpur and the entire waste generation from the city and outskirts arrives in the dumping site, our current study area. The area of the dumping site is approximately 13,816 m. It is in the low-lying riverine area of Nagapatty. Dumping in the area has been continuously done for the last 15–20 years. The total population in the immediate vicinity area is approximately 10,000. The dumpsite contains a mixture of both organic and inorganic waste materials, such as food wastes, papers, cardboards, metals, tins, glass, leather, ceramics, battery waste, textile rags, plastics, etc.



Open Littering on Soil

Heavy metals, also regarded as toxic metals, are the important environmental pollutants that affect all forms of life. Accumulation of toxic metals in plants results in various biochemical, physiological, and structural disturbances, leading to inhibited growth and sometimes plant death. Toxic metal contamination disturbs the soil ecology as well as the agricultural productivity. Several indigenous microbes can withstand the effect of toxic metal and play a vital role in the revival of tarnished soil.

(Source: Investigation of groundwater and soil quality near to a municipal waste disposal site in Silchar, Assam, India)

Cachar Paper Mill (CPM) and ONGC industrial unit forms some of the flagship industrial operations of the area. Silchar is the gateway to the nearby states of Mizoram and parts of Manipur. The amount of municipal waste generated in the Cachar Paper Mill (CPM) and ONGC industrial unit forms some of the flagship industrial operations of the area. Silchar has been affected by the open dumping of untreated MSW. The pH values of surface soils indicate a gradual decrease in acidity with increasing depth in the soil profile of the study area. The order of abundance of the elements at all depths (surface, 15 and 30cm) was found to be $Zn > Fe > Ni > Cu > Cr$. A weak correlation between the concentration of Cu, Fe and Zn, and the bulk density of the soil highlighted the micronutrient status of the soil. Extremely high geo-accumulation indices indicate towards 'extremely contaminated' status of the soils with respect to all analyzed elements point towards the potential effect of the open dumping process. Majority of the groundwater samples exhibited pH levels below the desired limits. While Fe, Cu and Ni levels in groundwater samples exceeded the guideline values, Cr and Zn concentrations were found to be within limits.

10.10.3 GROUND WATER POLLUTION

Water pollution is a phenomenon which is characterized by deterioration of the quality as a result of various human activities. Water pollution is a phenomenon which is characterized by deterioration of the quality because of various human activities. It plays an indispensable role in the life of every species that survive in the world and is required by all living organisms for their existence. Improper management and reckless use of water systems are causing serious threats to the availability and quality of water. Due to a rise in soil pollution by dumping of municipal waste, industrial waste, and heavy use of chemical fertilizers in agricultural land, properties of underground water have also been changing in Silchar.

The geology and geomorphology of Barak Valley have a direct bearing on the geospatial distribution of groundwater bodies. Geologically Surmas are the oldest rocks exposed comprises of poorly fossiliferous, thick succession of alternating shales, mudstones, siltstones and sandstones of varying proportions that infilled the basinal area of the Silchar Basin. The highest mean Nitrate concentration of 0.484 mg/l was recorded at Silchar-North. Consuming too much nitrate can affect how blood carries oxygen and can cause methemoglobinemia (also known as blue baby syndrome). Bottle-fed babies under six months old are at the highest risk of getting methemoglobinemia. Methemoglobinemia can cause skin to turn a bluish color and can result in serious illness or death. Other symptoms connected to methemoglobinemia include decreased blood pressure, increased heart rate, headaches, stomach cramps, and vomiting.

Concentrations of sodium, potassium and conductance were lower in post-monsoon than that in the pre-monsoon. The concentrations of nitrate and phosphate also decreased during post-monsoon. It appears that charging of aquifers during monsoon results in dilution of these variables as observed in post monsoon period.

Ground water resource is mainly utilized for drinking purposes. It has little industrial use as there is no major industry in the district. Dug well of 10 to 15 m depth and shallow tube well (STW) can be constructed along the fringe area of the district. Deep tube well of 300 m depth or more can be constructed in the alluvial plains of the district. The aquifer zones should be selected properly with the help of electrical logging device. Proper gravel packing should be done with 2 to 4 mm diameter gravel and thickness of gravel pack should be minimum 4" to avoid sand rushing. Optimum use of the tube well should be ascertained to avoid probable hazards. It is known that the area receives a high amount of rainfall throughout the year. Rainwater harvesting should be adopted to augment ground water resources. Proper planning of available ground water resource, available surface water and rainwater harvesting may lead to overall development of the district with respect to water management.

(Source: Central Ground Water Board, North-eastern region, Cachar District Assam)

10.11 ENVIRONMENTAL STRATEGIES

10.11.1 PROTECTION OF WATER CHANNELS

Protection/conservation of water channels is as much important as preserving a lake as these are the main channels, which brings water to the waterbody. Every stream, tributary, or river has an associated watershed, and small watersheds aggregate together to become larger watersheds. Stream systems have been classified according to their relative position within a stream network in order to understand, discuss, and explore similarities and differences between them. Many stream order classification systems have been developed, but no single system has been universally accepted. One of the earliest methods developed, and arguably the most commonly used method today, was developed by Strahler in 1952. In this system, the smallest head-water tributaries are called first-order streams. Where two first-order streams meet, a second-order stream is created; where two second-order streams meet, a third-order stream is created; and so on.

The major/important water channels with their orders are identified and the identified primary, secondary and tertiary water channels are given a buffer. The buffer zone for water bodies are categorized according to proposed planning strategy. The detail of the buffers are given in the proposed strategy.

In this buffer zone, regulated development is allowed. Protecting the drains will ultimately provide a smooth drainage in the area reducing the risk of flooding and water logging, ensuring uninterrupted flow of water to the waterbody. Other than this, detailed Environmental Management Plan has to be prepared which extensively studies the environmental parameters of the region. Under which numerous proposals can be developed. One of them can be identification of various catchments where the ground water recharge can take place. A concept of green infrastructure can also be adopted. At the site scale, different green infrastructure proposals consisting of site-specific management practices (such as interconnected natural areas) that are designed to maintain natural hydrologic functions by absorbing and infiltrating precipitation where it falls can be introduced.

10.11.2 SUMMARY OF ENVIRONMENTAL STRATEGIES

- The south bank of Barak River which falls under Master Plan area should be protected as special area upto 50 mt for Public realm and recreational spaces.
- Both side banks of Ghagra River fall under SMPA should be protected from urban settlement and need to be utilized as Organic farming and recreational spaces.
- The water bodies (ponds/Lakes) outside the conurbation area should follow the 30m buffer from the edge of the water body boundary.
- The Badri river stretch which fall under the SMPA should have the 15 m buffer on both the sides.
- There is a lack of green spaces/recreational area in the planning area. Thus, after the detail study the city level and neighborhood level parks/playgrounds are proposed.
- Tea Gardens are the traditional farming activity observed in the Planning Area, hence this area will be preserved by declaring agricultural zone under Master Plan -2045 and Regulated Development will be allowed in certain parts of this area.

10.11.3 RECREATIONAL ACTIVITIES AROUND RIVER

- River Front Development
- Jogging trails around the Water Body
- Water sports activities

River Front Development

- Design, development adjacent to natural features in a sensitive manner to highlight and complement the natural environment in areas designated for development;
- Integrate development on river fronts with the natural environment to preserve and enhance views, and protect areas of natural drainage;
- Minimize grading to maintain the natural topography, while contouring any landform alterations to blend into the natural terrain;
- Screen development adjacent to natural features as appropriate so that development does not appear visually intrusive, or interfere with the experience within the open space system. The provision of enhanced landscaping adjacent to natural features could be used to soften the appearance of or buffer development from the natural features;
- Use building and landscape materials that blend with and do not create visual or other conflicts with the natural environment;
- Design and site buildings to permit visual and physical access to the natural features from the public right-of-way.

Jogging trails around waterbody

Jogging trails are popular for bird viewing, walking, bike riding and other outdoor activities. Land managers often design and maintain trails in expansive public use areas. There is increasing interest from homeowners, business owners, wildlife enterprise entrepreneurs, schoolteachers, boy scouts, hospital personnel, parks department staff and others to develop and maintain nature trails on smaller landholdings.

Nature trails can be designed to minimize human disturbance and impacts on wildlife, plants, soils, and waterways. A well-designed trail can aid in land management, such as through simplifying timber evaluations or creating fire breaks. Properly built trails also provide opportunities to teach youngsters about wildlife, forestry, and natural resources.

To reduce impacts of trails and trail users on wildlife and plants, best trail practices are:

- Align trails along or near existing human-created edges or natural edges rather than bisecting undisturbed areas.
- Keep a trail and its zone of influence away from specific areas of known sensitive species.
- Avoid or limit access to critical habitat patches.
- Provide diverse trail experiences so that trail users are less inclined to create trails of their own.
- Use spur trails or dead-end trails to provide access to sensitive areas because these trails have less volume.
- Generally, concentrate activity along trails rather than disperse it.
- Keep trail construction impact as narrow as possible.
- Concentrate weed control at road and trail crossings, trailheads, and riparian areas.

Water Sport Activities

Water Sport Complex could be identified on suitable river frontage area where water Sport activities like boating, Jet ski, riding could be promoted for public recreational activities.

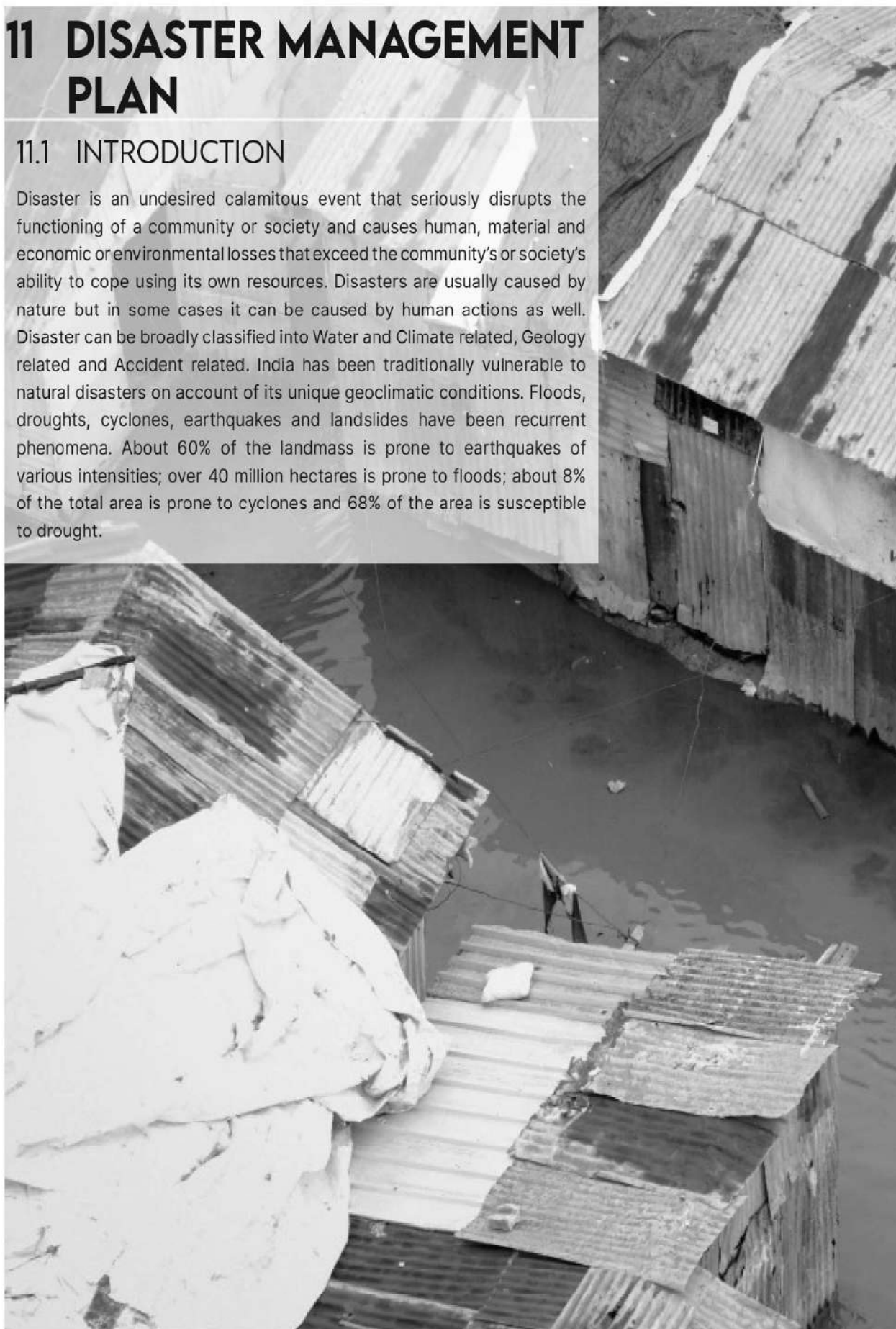




11 DISASTER MANAGEMENT PLAN

11.1 INTRODUCTION

Disaster is an undesired calamitous event that seriously disrupts the functioning of a community or society and causes human, material and economic or environmental losses that exceed the community's or society's ability to cope using its own resources. Disasters are usually caused by nature but in some cases it can be caused by human actions as well. Disaster can be broadly classified into Water and Climate related, Geology related and Accident related. India has been traditionally vulnerable to natural disasters on account of its unique geoclimatic conditions. Floods, droughts, cyclones, earthquakes and landslides have been recurrent phenomena. About 60% of the landmass is prone to earthquakes of various intensities; over 40 million hectares is prone to floods; about 8% of the total area is prone to cyclones and 68% of the area is susceptible to drought.





At the national level, the Ministry of Home Affairs is the nodal Ministry for all matters concerning disaster management. The Central Relief Commissioner (CRC) in the Ministry of Home Affairs is the nodal officer to coordinate relief operations for natural disasters. The CRC receives information relating to forecasting/warning of a natural calamity from India Meteorological Department (IMD) or from Central Water Commission of Ministry of Water Resources on a continuing basis. The Ministries/Departments/Organizations concerned with the primary and secondary functions relating to the management of disasters include: India Meteorological Department, Central Water Commission, Ministry of Home Affairs, Ministry of Defense, Ministry of Finance, Ministry of Rural Development, Ministry of Urban Development, Department of Communications, Ministry of Health, Ministry of Water Resources, Ministry of Petroleum, Department of Agriculture & Cooperation, Ministry of Power, Department of Civil Supplies, Ministry of Railways, Ministry of Information and Broadcasting, Planning Commission, Cabinet Secretariat, Department of Surface Transport, Ministry of Social Justice, Department of Women and Child Development, Ministry of Environment and Forest, Department of Food.

The Silchar Town of Cachar district is vulnerable to the natural disaster like floods, cyclones, earthquakes, Hail storm etc. The Silchar city is gate way of three districts of Barak valley as well as Tripura, Mizoram and Manipur. Considering the high Social and economic importance of Silchar town it is evident that any disaster here will have implications not only on the District and State but on the region as well. Hence to improve upon our capabilities with respect to Mitigation, Preparedness, Response and Recovery of any disaster situation it is important to have a City Disaster Management Plan (CDMP) in place.

11.2 CURRENT SCENARIO

Silchar city has 36 km river bed and this stretch is prone to many natural disasters like storm, river erosion and floods. This region has a history of floods and associated storm surges which have inundated vast areas of land along the river stretches of the Silchar region. Keeping the past history of disasters and susceptibility of the region to natural disasters, District Disaster Management, Silchar has formulated a "City Disaster Management Action Plan, 2012."

The basic objective of current Disaster Management Action Plan is to protect all the residents and the wealth of the region from all sort of untoward incidents through the following objectives:

- To prevent loss of human lives and property.
- Institutionalization of disaster management in district administration level.
- Encourage a culture of disaster preparedness.
- Vulnerability reduction and disaster mitigation through better planning process.
- Creation of best government mechanism to handle and unprecedented events.
- Instant response and effective decision making in disasters.
- Better coordination of relief and rehabilitation in the aftermath of a disaster.
- Better coordination of all line departments in disaster management.
- Regular updates of resources in and around the district.

11.2.1 FLOOD

Heavy rains are a predominant feature of the Silchar Region during the months of April, May, June and July, due to the lack of proper gradient and it inundates low lying areas, river bed areas and areas adjacent to natural drains & water bodies. Heavy rain fall is often accompanied by cyclones during North East Monsoon. Silchar has the land slope from west to east and from north to south. Silchar is classified as a multi hazard prone district. River erosion and floods have wreaked havoc in the city several times in the past few decades. Apart of the problem owes its genesis to the location of the city. The Silchar has a riverbed of approximately 36 km. Therefore, the city is vulnerable to the heavy floods due to its large catchment area. The drainage pattern is poor in the region and the encroachments of natural drains, and water bodies during drought years

has created a very difficult situation in the planning area. Slightly high rainfall from the normal level can lead to flood condition in several parts of the planning area and it disrupts the normal life of the local population living in low lying areas. Several residential areas like Rangpur, gets inundated even for normal rainfall conditions. In year 2018 total 721 hectare of land area affected by flood and 4,135 families need to be rehabilitated due to disaster. 1,909 persons were evacuated by NRDF and SRDF response team within district.

Table 205 Flood event and details

Sl. No.	Disastrous Event	Year of Occurrence	Area Affected	Name of localities	Population affected	Amount Incurred for Relief
1	Flood	1998, 2004, 2007, 2010, 2018	Silchar Sadar, Sonai, Katigora, Lakhipur & Udharband	Kanakpur, Berenga, Fatak Bazaar, Rangpur, Malinibill, Chencoree, Gossaipur, Bhagabazar, Palanghat, kabuganj, Arunachal, Borkhola, Ranighat, Gumra, Jalalpur, Bahadurpur.	1.80 Lakh (2018)	Rs. 1.32 Carore (2018)

(Source: Department of Disaster Management, Cachar)

11.2.2 EARTHQUAKE

Around 58 % of the territory of India is vulnerable to earthquake, and the country has experienced 3 main earthquakes in the past few decades. The state of Gujarat has experienced a major earthquake in January 2001, Jammu & Kashmir in October 2005 and Sikkim in 2011. The major consequences of any earthquake are wide spread human and material losses, excessive damage to infrastructure and services. According to the Geographical Survey of India, Seismic Zoning Map of the country, Silchar region lies in Zone-V which is said to be the most active seismic zone in the Country. The North-East part of the country where the Silchar region lies has observed major earthquakes in year 1984 and 2009.

Table 206 Earthquake in Silchar

Sl. No.	Disastrous Event	Year of Occurrence	Area Affected	Name of localities
1	Earthquake	1984, 2009	Tremor felt in: Silchar Sadar, Sonai, Katigora, Lakhipur & Udharband	All the Five circles of District

(Source: Department of Disaster Management, Cachar)

11.2.3 DROUGHT

Drought is a very less frequent observed calamity in Cachar district. The last drought observed was in year 2009 and the affected district was Silchar Sadar, sonai. Kathigora, Lakhipur and Udharband.

Table 207 Drought and its details

Sl. No.	Disastrous Event	Year of Occurrence	Area Affected	Name of localities
1	Drought	2009	Silchar Sadar, Sonai, Katigora, Lakhipur & Udharband	All the Five circles of District

(Source: Department of Disaster Management, Cachar)

11.2.4 FIRE ACCIDENT

Fire is an unpredicted calamity mostly not observed in a fixed period of interval. Some of the fire disasters have been noticed in past years, which is mentioned below in table.

Table 208 Fire Accidents and its details

Sl. No.	Disastrous Event	Year of Occurrence	Area Affected	Name of localities
1	Fire	2009, 2010	Silchar Sadar,	Janiganj Bazar, Phatok Baza

For the year 2018, various fire incidents of different types have taken place. A summary of all the Fire Incidences/Calls are as follows: -

Table 209 Fire incidents

Sl.No	Month	Fire	Special	Major	Medium	Smal	Life Lost
1	Jan	3	0	0	1	0	0
2	Feb	7	2	0	2	5	2
3	Mar	8	1	0	3	3	1
4	Apr	7	1	1	3	2	1
5	May	6	2	1	1	4	2
6	Jun	4	13	1	1	2	9
7	Jul	1	1	0	0	1	1
8	Aug	4	4	0	0	3	5
9	Sep	4	1	1	4	0	1
10	Oct	3	1	1	1	1	1
11	Nov	8	1	2	2	4	1
12	Dec	5	1	0	1	3	1
Grand Total		60	28	7	15	32	25

(Source: Department of Disaster Management, 2020 Cachar)

11.2.5 RIVER EROSION

River erosion is a season specific calamity observed in certain period of time mostly in fixed seasonal interval. In rainy season specifically from months April to July, when Barak river flows in its peak capacity level, the erosion on banks becomes disaster for the bank settled informal settlements. In year 2004, 2007 and 2010 river erosion in a massive scale was observed.

(Source: Department of Disaster Management, Cachar)

Table 210 River erosion

Sl. No.	Disastrous Event	Year of Occurrence	Area Affected
1	River Erosion	2004, 2007, 2010	Silchar Sadar, Sonai, Katigora, Lakhipur & Udharband

11.3 SEASONAL HAZARD ANALYSIS

Type of Hazards	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
FLOOD				←					→			
EARTHQUAKE	←											→
LANDSLIDE				←					→			
DROUGHT				←				→				
STORM			←		→							
FIRE ACCIDENT	←									→	→	→
River Erosion				←				→				
Industrial Hazard	←											→
Bomb blast	←											→
Road Accident	←											→

Figure 174 Seasonal hazard analysis

(Source: Department of Disaster Management, Cachar)

11.4 DISASTER VULNERABLE AREA MITIGATION PLAN

Any disaster management plan or emergency management plan consists of four phases, namely: Mitigation, Preparedness, Response and Recovery. The mitigation component in an emergency management plan is aimed at reducing the risk, impact, effects of a disaster. Hence careful planning in the mitigation phase is important to reduce or eliminate the Longterm risk to human life, property from natural and manmade calamities. It's important to have mitigation plans led by local community, working together to identify, plan for in the event of a disaster and reduce vulnerabilities and promote long term personal and community resilience and sustainability. Mitigation plans can concentrate on both pre-disaster and post disaster efforts to reduce the impact of the disaster.

Pre-disaster Mitigation should focus on projects and interventions to address natural and man-made disaster to reduce risk to the population and property. This is mainly achieved by strengthening the resilience of National/State Infrastructures. Post-disaster Mitigation efforts are primarily designed to reduce future damage in an affected area and decrease the loss of life and property due to the incidents following the disaster. The essential steps of hazard mitigation are: -

- Hazard Identification.
- Vulnerability Analysis.
- Defining a Hazard Mitigation Strategy.
- Implementation of Hazard Mitigation Activities and projects.

The Silchar region is more prone to Floods & Cyclone than any other natural disasters hence the disaster vulnerable area mitigation plan focuses on flood and cyclone related eventualities and how can it be mitigated and have a better preparedness. It is important to note that disaster management is an integrated task involving various government departments of Silchar region and the plan should focus on prevention, preparedness, mitigation, response and relief measures.

11.4.1 PREVENTION PLAN

As part of prevention of the said natural disasters, the following measures can be adopted by concerned government departments to avoid and minimize the impacts of natural disasters.

- The Public Works Department should monitor the major water bodies like rivers, streams, lakes for constant flow of water, rising levels, and identify potential areas along the water bodies which need additional embankment or revetments, and these works should be implemented on priority before the onset of the season.
- Power and Communication should carry out through inspection of power lines, communication lines for defects and rectify them. Trees and branches which may damage power and communication lines should be trimmed or removed.
- Health department should ensure that the primary and community health centers are equipped with medicines and medical staff. Preventive vaccines for epidemics should be stocked in adequate quantity. Chlorination of drinking water should be ensured to avoid the outbreak of epidemics in the event of cyclones and floods.
- The Department of Disaster Management is the nodal agency in the Silchar Region and has already handled several flood and cyclone situation in the region. From this experience, it should be able to identify the low lying and vulnerable areas and the population of such places must be warned to be alert

and to be ready to move to the cyclone shelters or to safer areas or to the relief camps in case of warning of disaster.

- The Department of Civil Supplies & Consumer Affairs should decide for creation of buffer stock of food grains by making required withdrawal from the Food Corporation of India. Also, adequate quantities of Kerosene and diesel should be procured and made available through the Fair Price Shops.
- Department of Agriculture should take steps to publicise precautionary measures to be taken to save the standing crops in the vulnerable areas. Farmers should be encouraged to have platforms in their fields to stock the crops. Desilting of public and private irrigation channels should be ensured for quick drainage of paddy fields.
- Fisheries & Fishermen Welfare Department shall alert all the coastal villages and hamlets about the impending natural calamity and advice the fishermen not to venture into sea till normalcy is restored.
- Department of School Education shall keep all schools ready for accommodating the evacuees and keep the Central Kitchens to function around the clock with in charge of the centres. NCC and NSS students shall also be grouped to send them for relief works.
- Transport Department should keep ready the list of sufficient numbers of earthmoving vehicles, transportation vehicles such as trucks, tractors, tippers, poclains, mini buses etc. Further, all the listed vehicles allocated in connection with calamity has to be kept in roadworthy condition for using them in emergency.
- Fire Services Department shall keep available sufficient number of rescue materials, like life jackets, buoys, ladders and ropes.
- Department of Animal Husbandry & Animal Welfare should store fodder, cattle feed, poultry food etc. and also carry out the inoculation of animals against epidemics. The Key Village Units should harbour stray cattle with shelters.
- Local Bodies shall make arrangements for availability of Generators and pump sets at short notice. For areas with water logging Local bodies should clear the L & U type drains which normally clog due to plastic materials and silt.
- The Police Department shall set up a Search & Rescue Team which shall contain at least 20 Police Personnel for each jurisdiction of the Superintendent of Police.
- Similarly, the Fire Services Department shall set up Search & Rescue Team consisting of at least 6 members of each Fire Service Station.

11.4.2 MITIGATION AND PREPAREDNESS PLAN

Pre- disaster planning consists of activities such as disaster mitigation and disaster preparedness. Disaster mitigation focuses on the hazard that causes the disaster and tries to eliminate or drastically reduce its direct effects. The best example of mitigation is the construction of embankments and construction of proper drainage system in flood prone areas to avoid floods. The other example includes retrofitting of weak buildings to make them earthquake resistant.

And preparedness focuses on plans to respond to a disaster threat or occurrence. It takes into account an estimation of emergency needs and identifies the resources to meet the needs. The first objective of the preparedness is to reduce the disaster impact through appropriate actions and improve the capacity of those who are likely to be affected most. The second is to ensure that ongoing development continues to improve the capacities and capabilities of the system to strengthen preparedness efforts at community level. Finally it

guides reconstruction so as to ensure reduction in vulnerability. The best example of preparedness activities are the development of community awareness and sensitization system through community education and administrative preparedness by way of stockpiling of supplies, developing emergency plans for rescue and relief.

For a successful mitigation plan it is necessary to identify short, medium and long term mitigation measures for various hazards for structural and non-structural risks and damages. Mitigation measures should focus to reduce both the effect of the disaster and the vulnerable conditions to it, in order to reduce the scale of a future disaster and its impacts. Mitigation measures should also focus at reducing physical, economic and social vulnerability of the region at the event of the disaster. Cyclone mitigation and preparedness largely hinges on the preparedness of the community. The following steps can be taken to reduce the risk in the unfortunate event of the said natural disasters.

- Restore Communication networks
- The task force in association with Search & Rescue Teams of Police and Fire should thoroughly search the affected area for survivors and injured.
- In case of heavy flooding and inundation, vehicular access may be restricted and hence suitable rafts/boats should be used to rescue and evacuate the people affected by the floods.
- The water logged in low lying residential areas should be pumped out and the pumped out water could be let through the nearest natural drain or canal. Also, fire engines can be deployed to pump out water from affected areas during emergencies.
- Any breach in rivers, streams or natural drains should be protected with adequate sand bags or creation of temporary embankments to avoid further damage to property and human life.
- In case of heavy storms, power supply to areas which are in the primary path of the storm can be disconnected to avoid hazards due to breakage of power lines. Provisions should be made to provide generators for temporary power supply to storm affected areas.
- Relief camps should be opened in appropriate locations where a large number of people are affected.
- Health facilities like General hospitals and Medical Colleges should be ready to accept crowd in case the primary health centers get over crowded.

11.4.3 RESPONSE PLAN

Response measures are those taken immediately prior to and following disaster impact. It is important to have clear organization structures with established line of authority within the government mechanism to handle the response plan in case of natural calamities. The plan should detail out the various phases from early warning to rehabilitation and the roles that agencies play in reaching the vulnerable and affected to identified disaster support infrastructure located in the Silchar Region. Response plans include formation of functional teams and providing plans for transportation, evacuation, search and rescue, and rehabilitation. They are supported by supervisory zone-based teams assuring food, shelter, water, medicine to the vulnerable in order to uphold physical and psychological health. Survey and assessment should be the part of response activity.

Coordinated IEC activities should be initiated well in advance.

- Mock drill of preparedness should be carried out twice in a year. The mock rehearsal should start from the Control Room. This will help in finding out the preparedness level for the district level functionaries.

- Make separate plan of operation and list of required materials, tools machineries for each kind of disaster.
- Train the rescue forces with the equipments and specialize them for the different types of disaster by the experts.
- Train the Panchayat leaders / village volunteers/ Villagers for helping the affected people for the disaster of their concern.
- Half yearly review the stock of men, materials and machineries of all lined departments.
- Approach to NDMA and ASDMA for any kind of assistance to the line departments for up-keepment of their machineries and strengthening the resources.
- Warning system through Police Control Room (24x7) DDIPR/AIR/DIO.
- The Incident Command Officer shall organize regular coordination meeting with all DM Committee Members, Head of office, Public leaders, NGO and senior citizen in consultation with the Chairman.
- The Incident Command Officer will liaise with all Head of office, NGO, Public Leaders and other organizations to keep their machineries and manpower in readiness to face occurrence of any type of natural disaster.
- The Incident Command Officer shall keep record of all parameter which might
- Indicate occurrence of any type of natural disaster and intimate the concerned higher
- Authority in weekly / daily basis.
- The RRTs (Medical & Police) will be alerted by the Incident Command Officer.

11.4.4 RELIEF PLAN

11.4.4.1 During the Disaster.

- Disseminate the warning of disaster from DDR&IC to all concerned destination in single attempt by using mass sms, announcement through radio, through mass voice mail and ask the people who are likely to be affected, to take shelter in safer places.
- Immediate deploy the forces to clear the route of search & rescue and also to clear the traffic from the route of rescue.
- Command to the forces, NGO, SHG & volunteers to rush immediately to the affected area for search and rescue with all pre-enlisted tools and equipments for particular disaster.
- During the time of occurrence of disaster, the Nodal Officer shall liaise with all Head of office, Public Leaders and others organizations and initiate prompt measures to prevent loss of human lives and property damage.
- The Nodal Officer shall initiate immediate necessary measure for evacuations, organize Search and Rescue teams with consultation with the concerned Member which have been entrusted to this work.
- If necessary, the Nodal Officer will initiate setting up of Relief Camp for the affected people in a safer place and ensure proper supply of safe drinking water, electricity, medical facilities and rations etc. with the help of concerned departments to the relief camp.

11.4.4.2 Post Disaster:

- A Post- disaster evaluation should be done after the withdrawal of relief and rehabilitation activities in order to assess
- The nature of state intervention and support,
- Suitability of the organizational structure,
- Institutional Arrangements,
- Adequacy of Operating Procedures,
- Monitoring mechanism,
- Information tools,
- Equipments,
- Communication System, etc.

The impact studies on the aforesaid operations for long term preventive and mitigation efforts are to be undertaken.

Evaluation exercises may be undertaken to understand the perceptions about disaster response in terms of

- | | |
|-----------------------------|------------------------|
| • Adequacy of training | • Security, |
| • Alert and warning system, | • Containment, |
| • Control Room functions, | • Recovery procedures, |
| • Communication plans, | • Monitoring. |

11.4.5 RECOVERY

In the unfortunate event of a natural calamity like a cyclone or flood its important focus on the methods and activities to restore lifeline support physical infrastructure like adequate water supply, power and communication networks, accessibility to the site. These must be the described in the disaster management plan- relief & recovery part. In the river side of the Silchar region the communities are depended on the specific infrastructure for their livelihood and these should be identified and methods to restore them in short/ medium/long term have to be identified and respective funding reequipments have to be made available and followed by speedy decision-making process.

In the District, the Nodal agency plays direct and active role in relief. The Deputy Commissioner office either directly or through assistance will inform to the nearest police stations, WT stations, administrative officers and nodal agencies at Circle, Sub-Divisional and Dist. HQ by quickest means. For timely assistance to the people affected by natural disasters it is necessary to have correct assessment of extend of damage to crops, public & private properties and loss of human lives and livestock. The emergency relief measures and relief measures in the aftermath of a disaster is generally carried out in compliance with Calamity Relief Fund Norms by Deputy Commissioner.

The task force is responsible for collecting the extend of the damages with respect to number of houses damaged, loss of human lives, number of person injured, information about individual families, their income, property and assets. The zonal officer has to prepare a report on the same to be sent to the Deputy Commissioner. The mentioned assessment is to be carried out on priority basis so that the Nodal Department in the district Region which is the Department of Disaster Management can extend relief assistance in time in order to mitigate the effect of the natural disaster.

11.5 CITY DISASTER MITIGATION PLAN

The points mentioned above should be part of a larger city or region level disaster management plan. The Disaster Management Act, 2005 has brought a change from Response & Relief oriented approach to proactive and comprehensive approach. This has encouraged many Indian cities to develop and formulate a City Disaster Management Plan, the same should be worked for Silchar MPA as well to enable it to be better prepared in the case of natural disasters in the future. As part of the Master Plan 2045 the authority feels there is a need for a CDMP for the planning area covering the following general principles: -

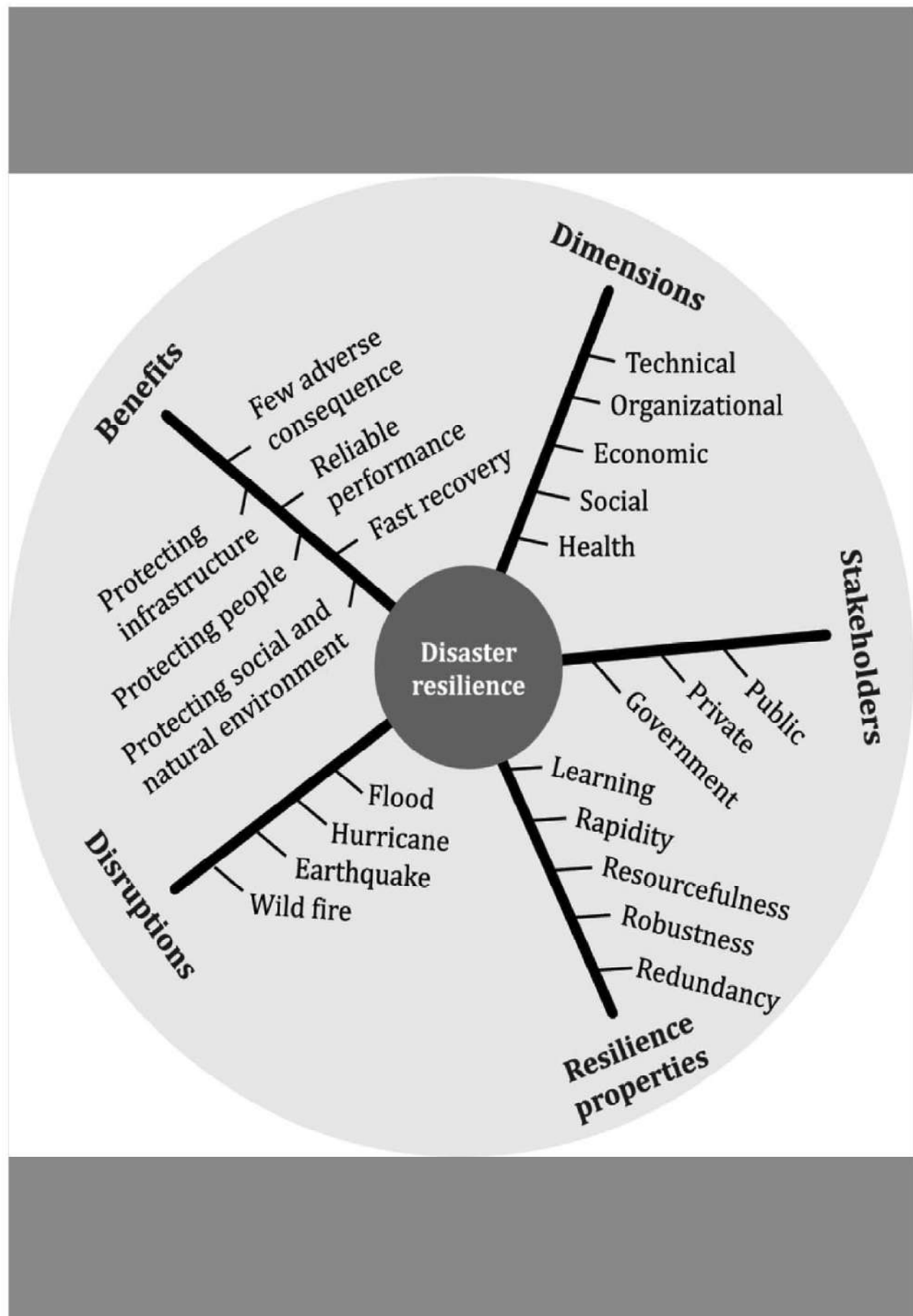
- Risk & Hazard Assessment
- Planning
- Organization
- Resource Utilization
- Need for Specialist
- Training

Generally, the CDMP prepared for the planning area should include sectoral plans covering the following aspects of disaster & emergency management: -

- Overall Preparedness
- Rehabilitation
- Emergency Response Prevention
- Mitigation
- Recovery
- Reconstruction
- Capacity Building Plans

Based on the above discussed general principles a detailed City Disaster Management Plan (CDMP) for Silchar Planning Area have to be prepared for strengthening the institutional mechanism.

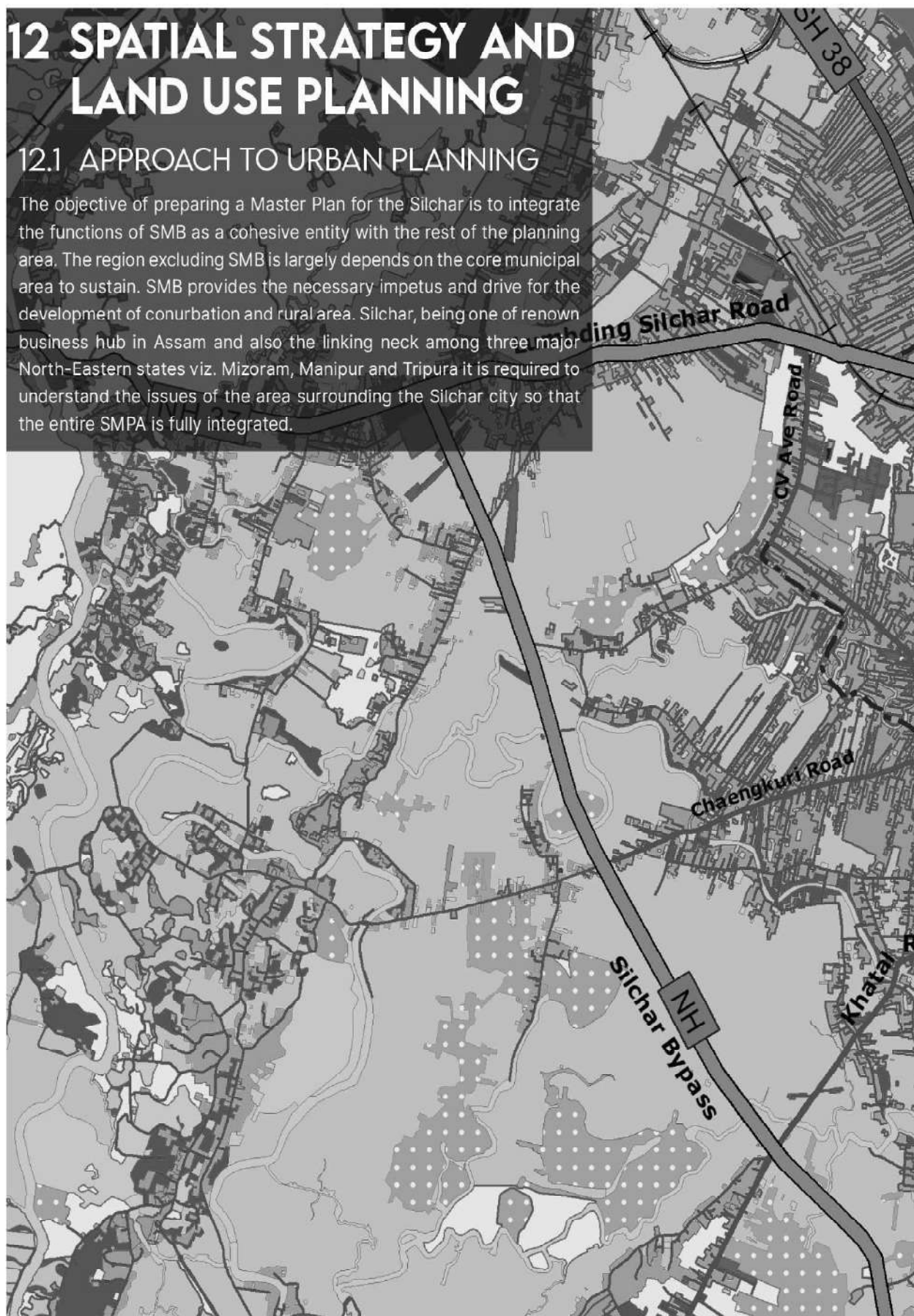


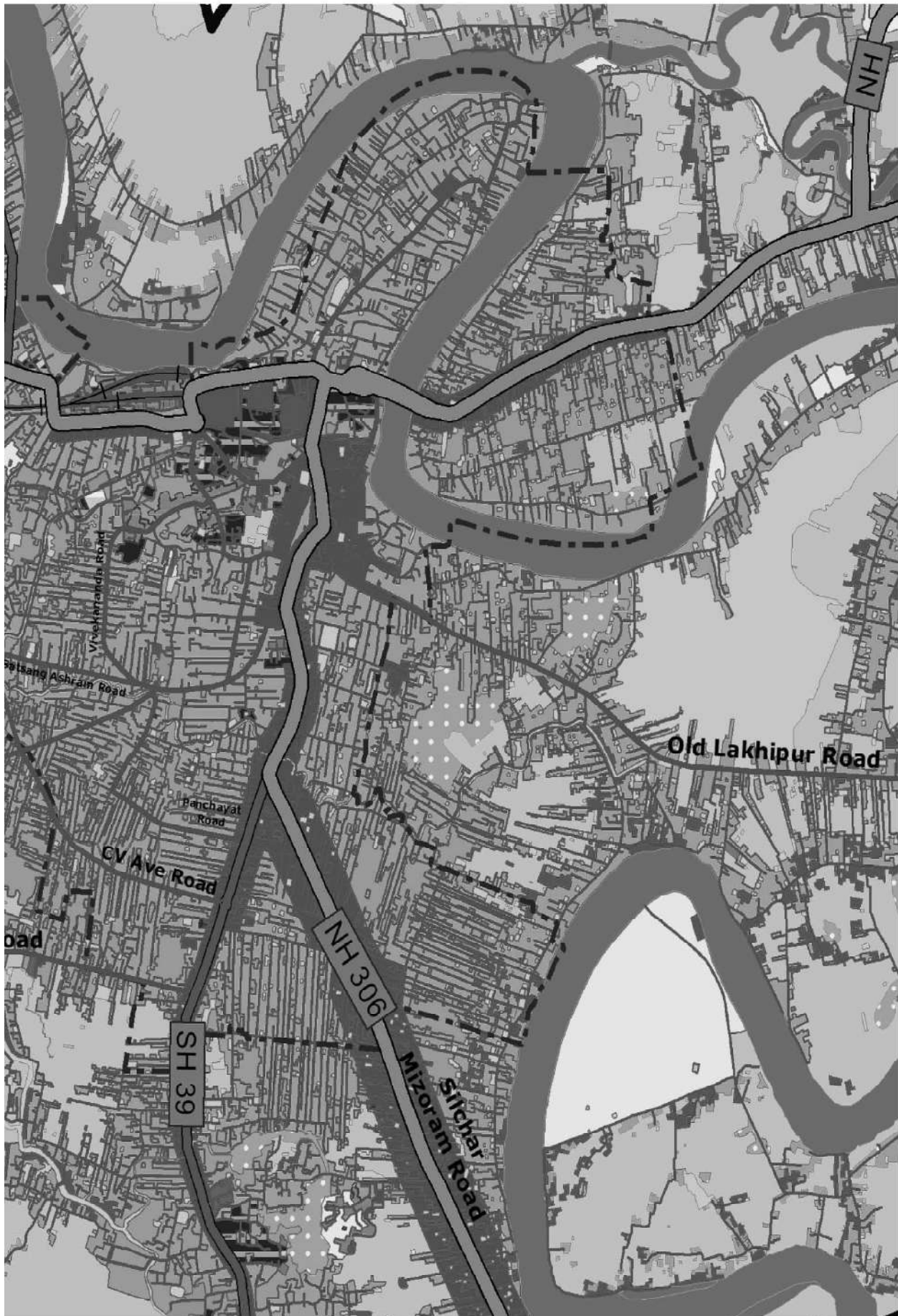


12 SPATIAL STRATEGY AND LAND USE PLANNING

12.1 APPROACH TO URBAN PLANNING

The objective of preparing a Master Plan for the Silchar is to integrate the functions of SMB as a cohesive entity with the rest of the planning area. The region excluding SMB is largely depends on the core municipal area to sustain. SMB provides the necessary impetus and drive for the development of conurbation and rural area. Silchar, being one of renown business hub in Assam and also the linking neck among three major North-Eastern states viz. Mizoram, Manipur and Tripura it is required to understand the issues of the area surrounding the Silchar city so that the entire SMPA is fully integrated.





Urban planning refers to the rational and judicious approach of allocating available land resources to different land using activities and for different functions consistent with the overall development vision / goal of a particular region. The main objectives of land use planning area.

1. To promote efficient utilization and disposition of land ensure the highest and best use of land.
2. To promote desirable pattern of land uses to prevent wasteful development.
3. To preserve areas of ecological, aesthetic, historical and cultural significance.

In the chapter, it details out the visions, goals & planning concepts adopted for the preparation of GIS Based Master Plan for Silchar Planning Area-2045. It then presents the guiding principles and strategies adopted for various sectors and the applications of planning theories & techniques. Later on, in the chapter it elaborates the Land use policies & growth centre models adopted. The chapter concludes a detailed explanation of the concept plan for the planning area prepared based on the strategies to achieve the overall visions & goals.

12.2 EMERGING CONCERNS AND ISSUES

However, though its strategic location, Silchar as a whole is lagging behind the rest of the country. Flood and water logging are the main reasons that the region has not been able to come up to a certain standard of all-round development, particularly in the countryside. Apart from that, there are many other issues affecting the growth of the region, such as, weak infrastructure, and exhausted and congested CBD area, narrow accessible carriage ways encroached by unorganised retail sectors and Adhoc vending in the city core area. Following are the main emerging concerns and issues in the project area:

- Flood and Water Logging- Flood and water logging have been a major concern for the region since Silchar city has 36 km riverbed and this stretch is prone to many natural disasters like storm, river erosion and floods. This region has a history of floods and associated storm surges which have inundated vast areas of land along the river stretches of the Silchar region. Water level of the Barak River, inadequate drainage system, informal settlements, and lack of solid waste management are the main reasons for flooding and water logging in the region.
- Flowing river like Barak would have low pollution level; however, the river in the project area is polluted because of the raw sewage directly discharged into the river without any treatments. In addition, a vast portion of the municipal waste flows directly into the river through its tributary channels. Due to lack of efficient solid waste disposal mechanisms, people have a tendency to throw plastics and other garbage into the open drainage, which leads to clogged drains.
- Existing quality of roads in the region is extremely poor; on top of that, the encroachment on the roads has narrowed the streets, which is causing the traffic chaos. Not even the national highways passing through the region is four lane. The collector roads and streets of markets and narrow and lack of sufficient parking area. All these are creating traffic congestions in and around the city area.
- Neither artificial nor natural drains have the capacity to carry the storm water effectively. Additionally, untreated wastewater from residential, commercial, and industrial activities is discharged into the underground and open drains.
- Haphazard Development- throughout the region, number of illegal construction, encroachments on the pedestrian pathways and wetland, and violation of Byelaws have led to imbalanced built-open relationship.

12.3 VISION, GOAL AND OBJECTIVES

The Silchar GIS Based Master Plan - 2045 is initiated with the aim of achieving a better economic growth, better infrastructure facilities, and higher quality of life for the planning area while keeping the heritage, culture and form of the city intact and preserving the environment of the area. To achieve these, it is essential to set out goals and adopt the planning concepts and guiding principles so as to ensure maximum benefits and least adverse effects. The discontinues & non-homogenous geographical profile of the planning area which is a historical accident has thrown several challenges towards ensuring continuity and proper planned development. Despite this limitation, through forethoughts & reasonable approach to the situation desired results could be achieved. This section elaborates the vision statement, goals that are formulated to achieve the goals and the planning concepts, which will guide to achieve the same.

12.3.1 VISION

The Vision for the planning area perceived around the following core ideas:

1. Preserving our historical past, maintaining the livability of the present, and transforming our future through the implementation of the highest quality planning, to enhance the level of infrastructure service to all people of Silchar Region.
2. Plan and implement the future by guiding the physical and economic development of Silchar town while enhancing the quality of life for all through a comprehensive range of planning to promote the cultural, built and natural heritage in a sustainable manner.
3. Expand urban infrastructure to encourage appropriately compact, connected, and synchronized development by unlocking the potential of urbanization for better economic, social, and environmental outcomes at the heart of the government's economic strategy.

12.3.2 GOALS

Aspire to be Vibrant and Sustainable Urban entity for the Northeast India which is Socially Beneficial; Regionally Contextual; Environmentally Sustainable; Financially Viable; Institutionally Executable; and Politically Acceptable.

12.3.3 OBJECTIVES TO ACHIEVE THE VISION

1. To generate higher service facilities for attracting various developmental activities, investors and industrial houses.
2. To improve the Transport Network system for faster communication and high standard linkages between the Growth Centers and their rural hinterlands.
3. To transform the whole region to a pollution free zone with conservation of biodiversity and environment.
4. To manage the natural and human resources for followed development.
5. To frame land policies and development proposals for eradicating bottlenecks for future development.
6. To provide decent housing for all sections of people living in the region.
7. To formulate a Disaster Management Policies to tackle natural hazards.
8. To provide high levels of physical and social infrastructure ensuring safe drinking water, improved sanitation, well distributed education, health, recreation and cultural facilities.
9. To convert the region to a learning and trade centre for the state as well as nation.

10. To transform the region to a hub of tourism through preserving and promoting the rich cultural heritage and aesthetics of nature, with high standard facilities and convenience.
11. To design an effective development control mechanism with a high value of public serviceability.
12. To reenergize the institutional and administrative system to manage future urban.

12.4 PLANNING THEORIES

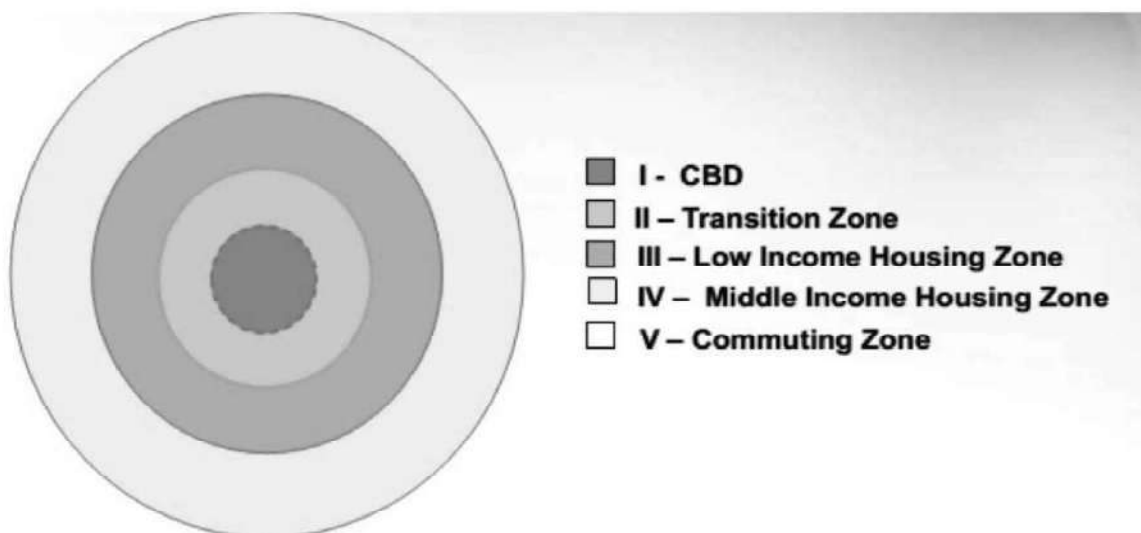
The planning is based on order of settlement, level of urbanization, planning area morphology it's evident that the growth over the last few decades are spearheaded due to certain factors like spatial organization of the several urban functions of commerce, production, education, and much more. One of the most important forces determining where certain activities or growth is focused within a city deals with the price of land. Thus, it is important to understand different urban models developed over the course of time. The different planning theories are explained in the following section to understand which theoretical model suits best for the planning area.

12.4.1 CONCENTRIC ZONE MODEL

The Concentric Zone model is a model of the internal structure of cities in which social groups are spatially arranged in a series of rings. The concentric zone model was resulted from a study of Chicago in the 1920's by Ernest Burgess. This model is also known as Bull's eye Model. The idea behind this model is that the city grows outward from a central area in a series of rings. The size of the rings may vary, but the order always remains the same. Under this model, five concentric functional zones are recognized. At the center was the CBD (1). The zone of transition (2) was characterized by residential deterioration and encroachment by business and light manufacturing. The zone of independent workers' homes (3) was primarily occupied by the blue collar (wage-earners, manual laborers) labor force. The zone of better residences (4) consisted mainly of the middle-class. Finally, the commuters' zone (5) was the suburban ring, consisting mostly of white-collar workers who could afford to live further from the CBD. This model was dynamic. As the city grow, the inner zones encroached on the outer ones.

Disadvantages:

- This model was developed for American cities and had limited applicability elsewhere.
- The model does not take into account any physical barriers and gentrification - which may occur in the cities.
- It does not address local urban politics and forces of globalization.



12.4.2 SECTOR MODEL

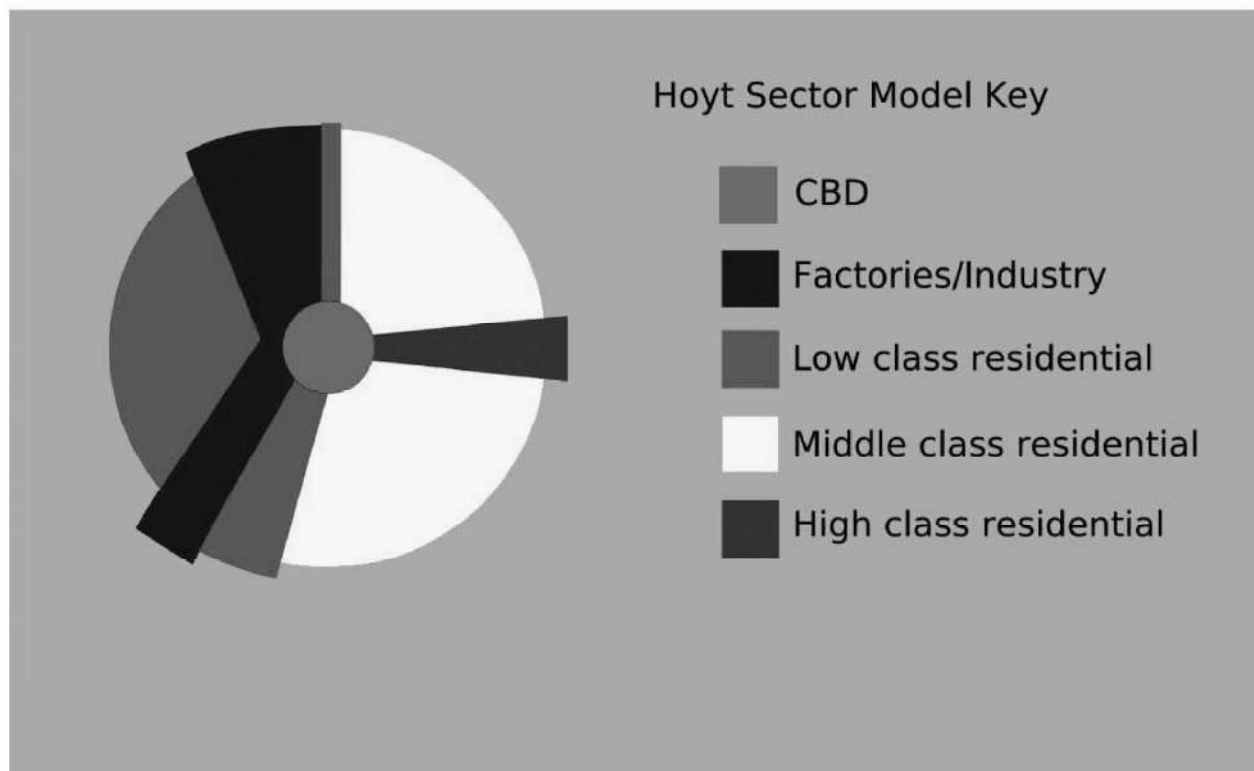
In the late 1930s, Homer Hoyt's sector model was published, partly as an answer to the drawbacks of Burgess' concentric zone model. This model was based both on urban land-use pattern and on demography. Hoyt accepted the existence of business district at the core, but suggested that various groups expand outward from the city centre along railroads, highways and other transportation arteries. As technology dealing with transportation and communication was improving, growth alone created more of a pie-shaped urban structure. Hoyt discovered that land rent (for residential, commercial, or industrial) could remain consistent all the way from the CBD to the city's outer edge.

Based on the above observation, Hoyt theorized the following:

- Cities tend to grow in wedge-shaped patterns—or sectors—emanating from the core business district and centered on major transportation routes.
- Higher levels of access meant higher land values; therefore, many commercial activities would be carried on in the central business districts, but manufacturing units would be developed in a wedge surrounding transportation routes.
- Residential areas would grow in a wedge-shaped pattern with a sector of low-income housing bordering manufacturing/industrial sectors (traffic, noise and pollution would make these areas least desirable), while middle and high income households would be located as far away as possible from manufacturing industrial units.

Disadvantages:

- The theory is based on nineteenth century transport and does not make allowances for private cars that enable commuting from cheaper land outside city boundaries. This occurred in Calgary in the 1930's when many near-slums were established outside the city but close to the termini of the street car lines. These are now incorporated into the city boundary but are pockets of low cost housing in medium cost areas.
- No reference is given to out of town development.



12.4.3 MULTIPLE NUCLEI MODEL

In the 1940s, Chauncy Harris and Edward Ullman, arguing that neither of the earlier models adequately reflected city structure, proposed the multiple nuclei model. This model was based on the notion the CBD was losing its dominant position and primacy as the nucleus of the urban area. Several of the urban regions would have their own subsidiary but competing "nuclei." As manufacturing cities became modern cities and modern cities became increasingly complex, these models became less and less accurate.

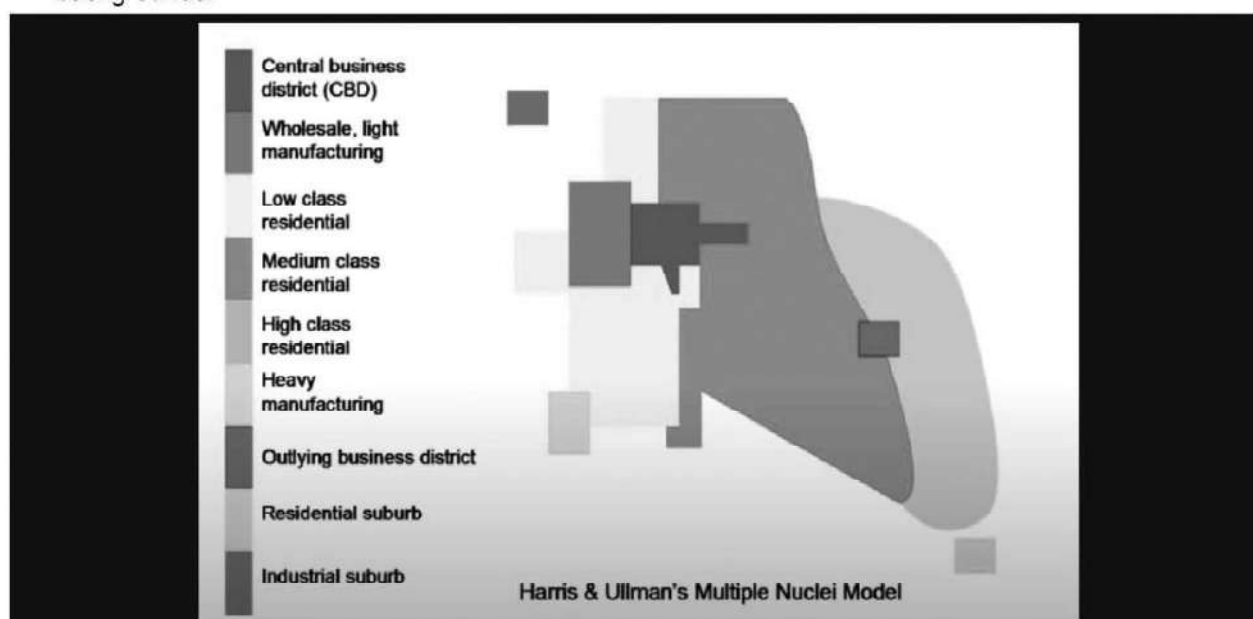
Today, there are urban realms, components of giant conurbations (connected urban areas) that function separately in certain ways but are linked together in a greater metropolitan sphere. In the early postwar period (1950s), rapid population diffusion to the outer suburbs created distant nuclei, but also reduced the volume and level, of interaction between the central city and these emerging suburban cities. By the 1970s, outer cities were becoming increasingly independent of the CBD to which these former suburbs had once been closely tied. Regional shopping centers (e.g., malls) in the suburban zone were becoming the new CBDs of the outer nuclei.

Advantages:

The advantages of this model lie in its multi nuclei approach - many sources give slight variants on the model shown in the diagram, since the model is rather flexible and adapts to local situations (the exact positions of the nuclei are not important but only the basic trends) so it can be modified to match the city under consideration.

Disadvantages :

- Negligence of height of buildings.
- Non-existence of abrupt divisions between zones.
- Each zone displays a significant degree of internal heterogeneity and not homogeneity.
- Unawareness of inertia forces.
- No consideration of influence of physical relief and government policy.
- The concepts may not be totally applicable to oriental cities with different cultural, economic and political backgrounds.



12.4.4 URBAN REALM MODEL

Vance's urban realms model is an extension of the multiple-nuclei model and is based on the San Francisco Bay area but has been applied to other US cities. The key feature is the emergence of large self-sufficient urban areas, each focused on a center independent of the traditional downtown and central city. The area, shape and other characteristics of each realm depends upon the following several factors:

1. The terrain – mountains and rivers and other barriers will help to determine the extent and shape of a region.
2. The size of the metropolis – a larger metropolis may have more and larger realms.
3. The amount of economic activity within each realm – a determinant of the area it can serve and hence its size.
4. The transport infrastructure available within each realm – an easily accessible economic core increases the area of influence and thus size of each realm.

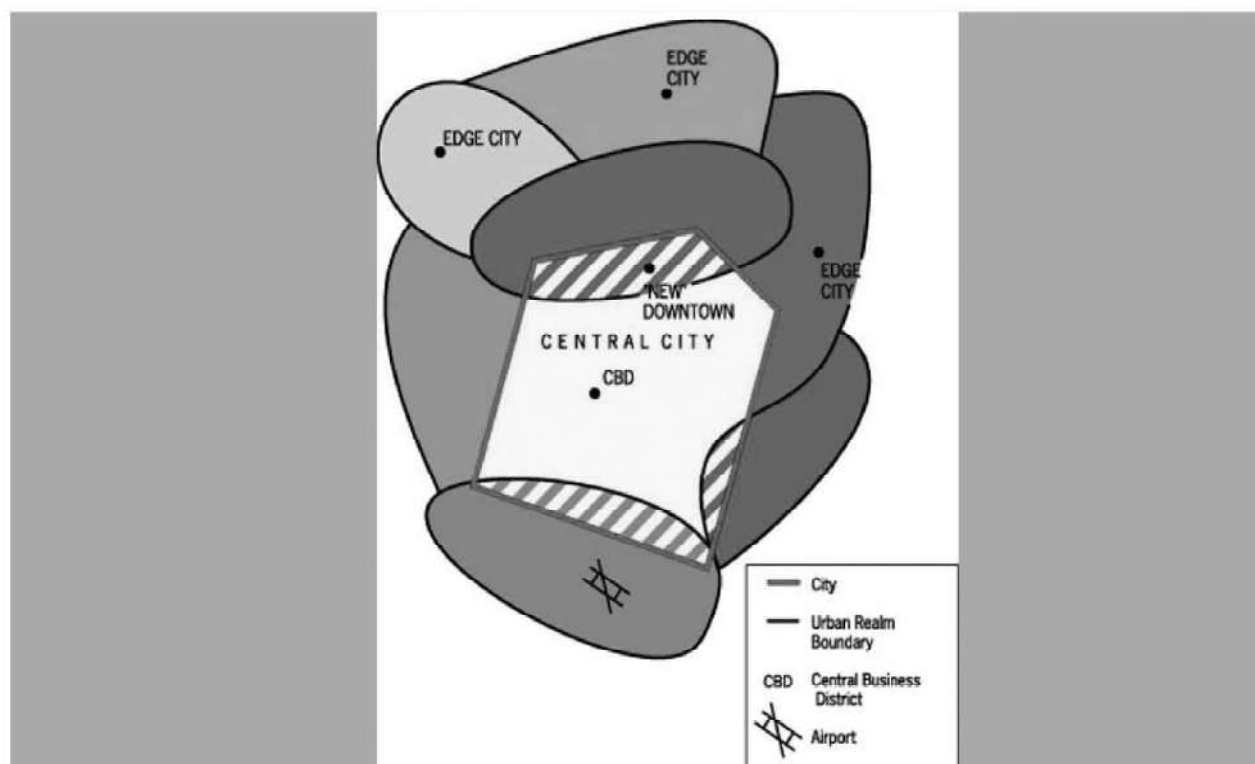
Transport infrastructure between realms – e.g. circumferential links (such as freeways) and airports such that people no longer have to travel to the CBD and its central realm in order to travel to other realms and to another metropolis. If a realm can become more important in this manner, then it may increase in importance. E.g. West Los Angeles is within easy reach of the LAX airport (along the freeway) but to travel by train residents have to travel to the CBD (by bus or car).

Advantages:

- If the city is successful, It can accommodate a large and growing population easily due to its automobile dependence.
- Each realm has its own economic strength, so overall the metropolis can be an economic powerhouse and can become some self-sufficient.

Disadvantages:

If a model fails, then the city displays a large amount of urban sprawl. Urban sprawl is the uncontrolled expansion of urban areas. Urban areas will expand into previously rural areas.



12.4.5 CENTRAL PLACE THEORY

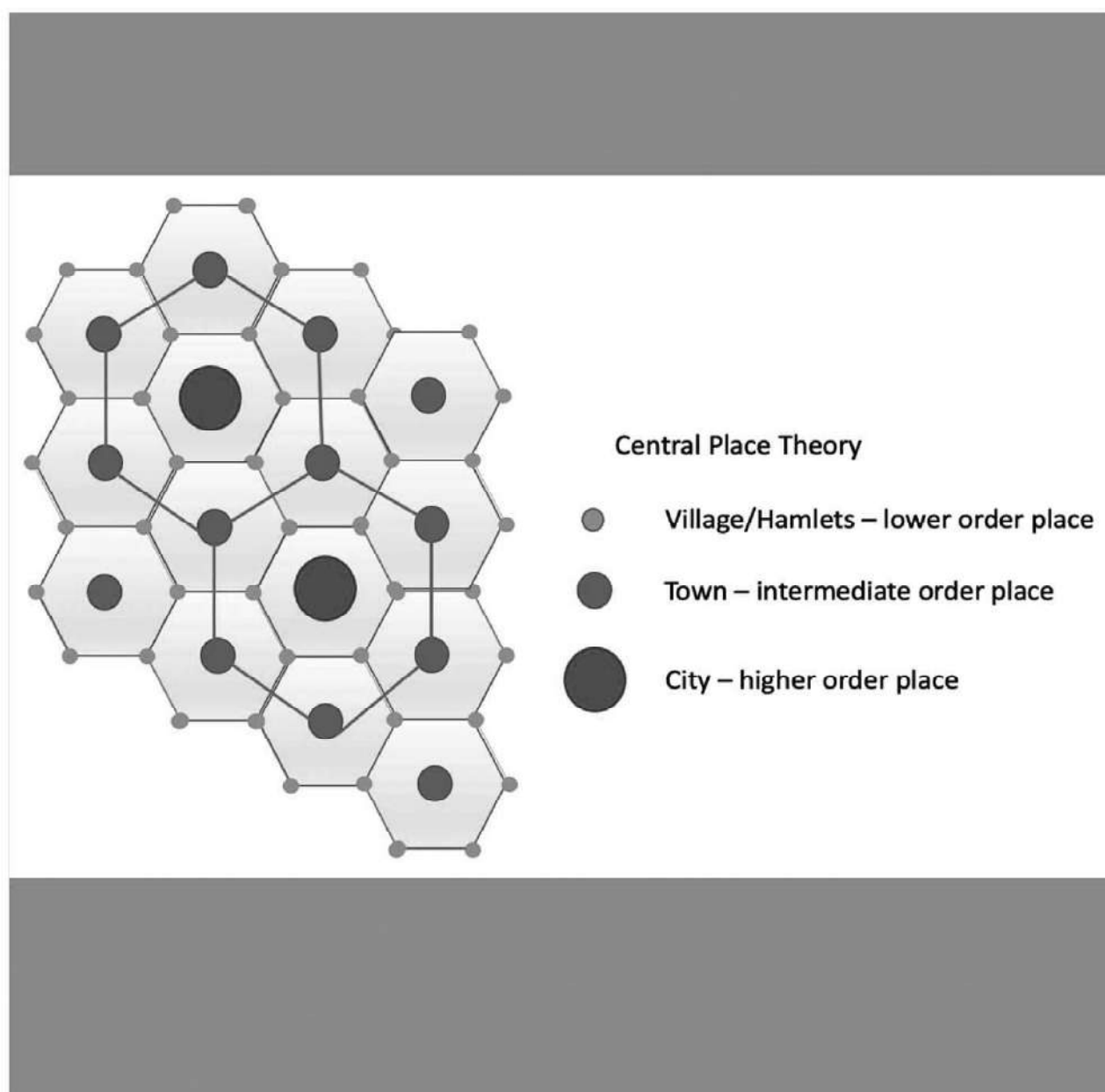
Central Place Theory (CPT) is an attempt to explain the spatial arrangement, size, and number of settlements. The theory was originally published in 1933 by a German geographer Walter Christaller who studied the settlement patterns in southern Germany. In the flat landscape of southern Germany Christaller noticed that towns of a certain size were roughly equidistant. By examining and defining the functions of the settlement structure and the size of the hinterland he found it possible to model the pattern of settlement locations using geometric shapes.

Advantages:

- The theory helps us understand the organization from a theoretical perspective and the spatial distribution.
- Important in Policy Making.

Disadvantages:

- The theory doesn't incorporate the temporal aspect in the development of central places.
- The theory is good for agricultural regions but not industrial or postindustrial regions.



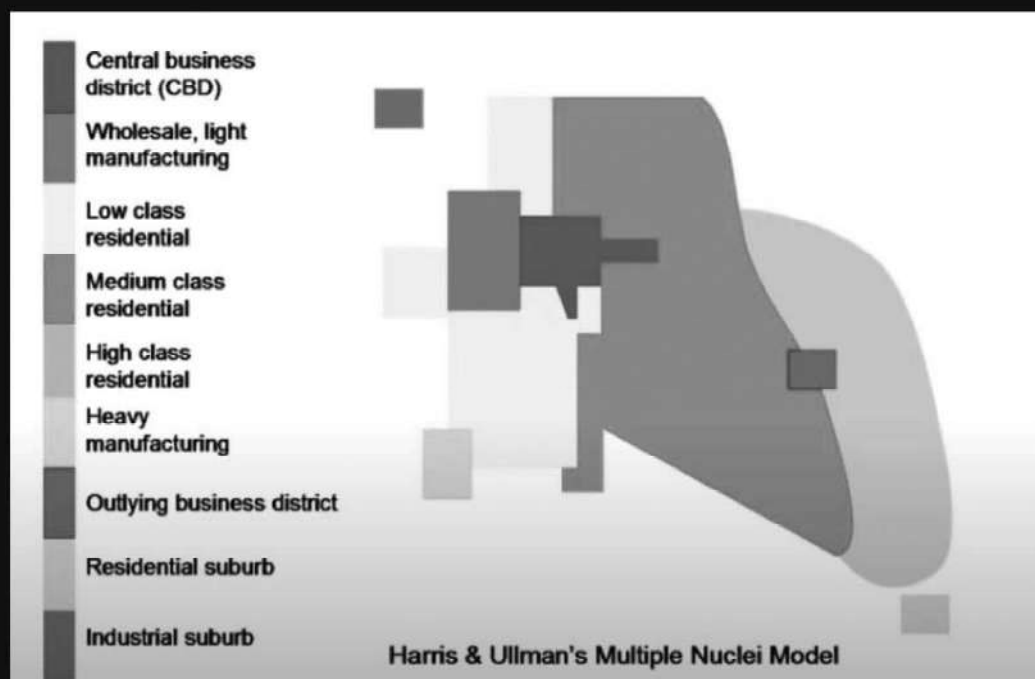
12.4.6A MODEL BEST SUITED FOR SILCHAR

After studying above mentioned theories, following analysis has been conducted. It is evident that concentric zone model is not suitable for Silchar as it was developed mostly for American cities and does not take into consideration any physical barrier or gentrification. Similarly, Sectoral model is also not applicable to SMPA as there is no allowances for private cars while considering the transportation sector. Additionally, it doesn't include any reference for the development which occurs immediately after town, which is the scenario in almost all Indian cities. In the case of urban realm model, if a model fails, then the city will start developing large amount of urban sprawl. This can't be applicable to Silchar due to the absence of contiguous mass of land. Additionally, in today's context, a city should focus less urban sprawl as a city can't afford to lose its agricultural area. Central place theory is also not applicable to SMPA as it is good for agricultural regions.

Multiple Nuclei Model is best suited for Silchar as it has a unique character of non-contiguous land mass. Additionally, the city has already developed a character where the application of this theory will become inevitable. The Major issues of the city can be solved with Multiple Nuclei Model.

Some of the issues include, the high-level congestion in the core town, increasing urban sprawl and decreasing agricultural land, haphazard development inside the planning area. Additionally, this model is flexible and can fit according to the local condition of a city/town. The other major reasons to adopt the Multi Nuclei Model in Silchar region are listed below.

- Silchar region possess majorly flat terrain.
- Silchar region is a noncontiguous settlement pattern paves the opportunity to develop the decentralization model.
- The administrative boundaries (noncontiguous settlement pattern) itself create the ways to decentralize the core activities from Central Business District.
- Silchar region is sharing the major road network with Assam as well Mizoram, Tripura and Manipur.
- Multi Nuclei model allows the even distribution of resources allocations.



12.5 GUIDING PRINCIPLES

The principles below further articulate the vision and are to guide planning of the proposed SMPA to achieve the foreseen vision.

12.5.1 TRANSIT ORIENTED DEVELOPMENT (TOD)

Transit oriented development is a mixed-use development integrating planning and implementations of transport and land use. Mixed-use developments include residential, commercial space and office space, or a combination of the same. Generally, mixed-use development is within easy access to transit corridors. Development within easy accessibility to the transit corridors encourages residents and workers to use public transit more often over private vehicles.

12.5.2 URBAN RURAL CONTINUUM

Rural Urban Continuum is essentially the gradual change observed in terms of intensity of development from core city areas towards the peripheral area. The nature of settlement structure helps to understand the rural-urban dichotomy or continuity. In the initial stage, the change can be seen in form of changes in agricultural land use, in terms of high commercialization of agriculture activities. In the later stage, the change can be seen in occupational structure of the rural areas, in terms of when the rural population starts responding to possible employment opportunities in the surrounding urban areas. As time passes, the range of private enterprises would widen to include almost every type of enterprises sectors. Public transport would be the means of commutation, houses would be improved and better furnished; however, the basic amenities such as water supply, sewage disposal and drainage may not show any improvement. In the third and the last stage, changes in urban land use would be observed.

12.5.3 MULTIPLE NUCLEI CONCEPT

Population of metropolitan area will grow along with a growth of the metropolitan area, and so the demand for the infrastructure too will grow. By creating, multiple nuclei centers will help reduce the burden of providing sufficient infrastructure from the metropolitan area. These nuclei centers can be identified based on the physical demarcation and accumulation of cluster of activities. They would not be the absolute population accumulation in a particular area but the service population with different size.

12.5.4 URBAN GROWTH BOUNDARY

Urban growth boundary circumscribes the possible urbanizable and developable area. Local governments would use the boundary as a guide to zoning and land use decisions. The local or regional government does not support development for a specified period beyond an officially adopted and mapped line. Growth is supported inside the boundary with utilities and development-friendly policies. Growth is discouraged outside the growth boundary. The purpose of providing urban growth boundary is to synchronize existing urban growth with the provision of infrastructure needed to accommodate future growth, and to promote compact and contiguous development patterns that can be effectively served by public services; as well as to preserve open space, agricultural land, and environmentally sensitive areas that are not currently suitable for urban development.

12.5.5 PERI URBAN DEVELOPMENT

UNDP (1996) defines peri-urban as an activity that produces processes and markets food and other products, applying intensive production methods and reusing natural resources and urban wastes to yield a diversity of crops and livestock. Peri urban in addition can also involve animal husbandry, aquaculture, agro-forestry and horticulture.

12.5.6 PROVISION OF SOCIO-PHYSICAL AMENITIES

URDPFI guidelines will be base line for foreseeing the socio-physical amenities requirement for the horizon year 2045.

12.6 CONCEPTUAL PLAN DEVELOPMENT

To achieve the vision and goals set for the planning area it is critical to have a concept, which illustrates the long-term direction guided by planning principles.

Several considerations were taken into account while formulating the concept for the planning area, which are listed below.

Socio-demographic Projections

- Current Growth Trends
- Level of Urbanization
- Stakeholder Meeting Suggestions
- Suggestions from various Government Organization, NGOs etc.
- Existing Physical & Social Infrastructure
- Existing Land Use Analysis & Land Availability for Future Development
- Economy of planning area
- Govt. Policies & Future Projects

Based on the various analysis and exploration the nodal points are identified for the projected year 2045. The figure 169 reveals that the identification of Growth Centers, Growth Points and location for the Multi Modal Transit Centres in Silchar region. They are detailed in the table 211.

Table 211 Details of Development Centres and Nodal Points

Multi Nuclei Model Silchar Planning Area- 2045		
Sr.No.	Development Centre	Nodal Point
1.	Growth Centre	Uttar Krishnapur
		Chengkuri Grant
		Berenga PT 2
		Gossaipur Part III
2.	Growth Point	Bali Ghat
		Khatal Grant
		Bhorakhai Grant
3.	Transit Hub	Tarapur IV

The planning area currently accommodates 4.7 lakhs of population with a gross density of 27 persons per hectare and this population is projected to grow to almost 8 Lakhs by 2045. The planning area have certain inherited nodes like the Institutional area, Industrial area, Municipal areas & its Outgrowth and the rural hinterland. For ease of planning, the Silchar Planning Area is divided into three zones as mentioned above.

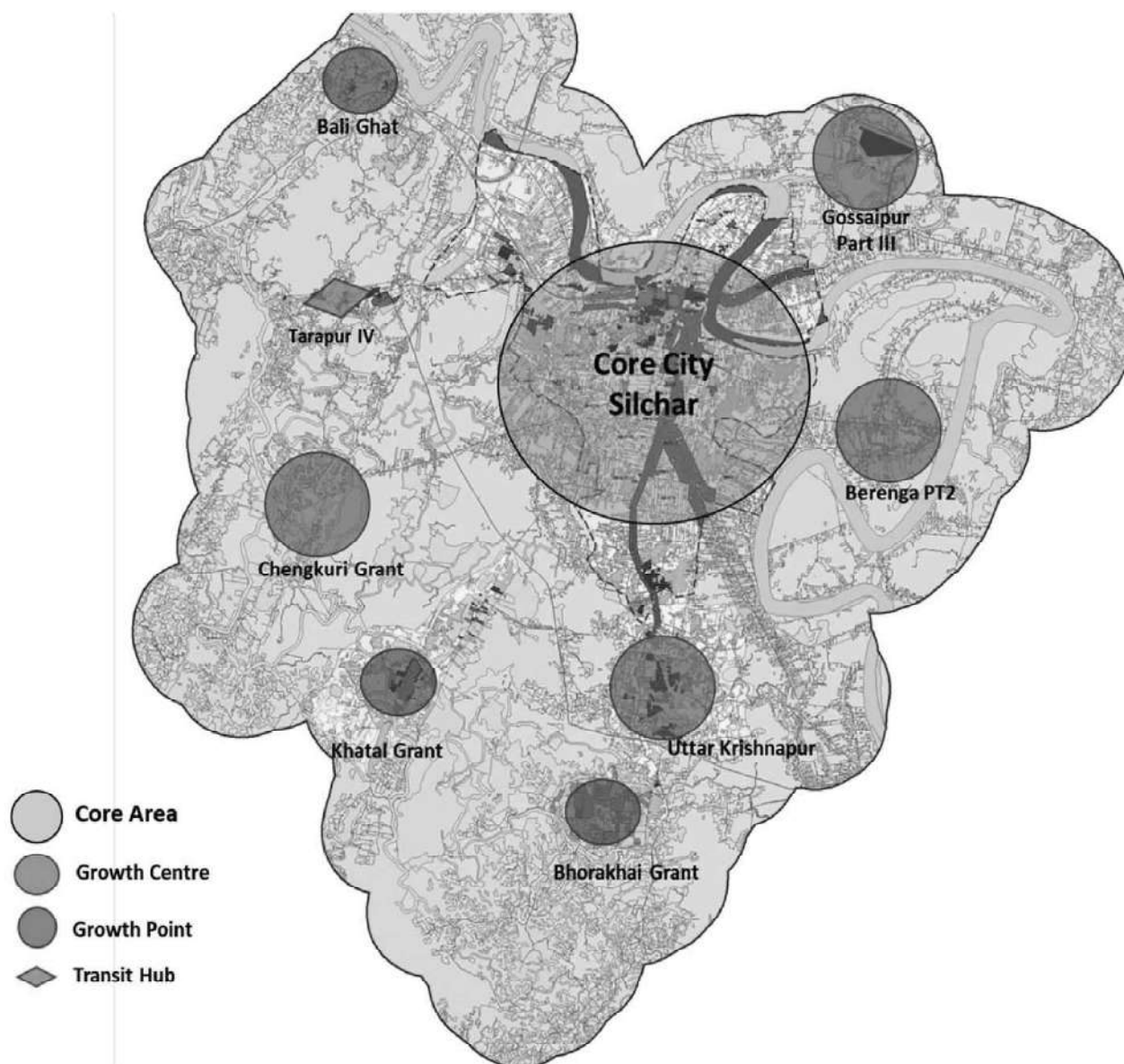


Figure 175 Concept Plan for Silchar Master Plan Area - 2045

12.6.1 CONURBATION AREA

Conurbation area is a continuous urban area comprising of towns and their outgrowths merged with each other due to physical expansion and population growth. In the case of Silchar, Existing Conurbation area includes Silchar Municipal Board, 3 Census Towns (Ambikapur X, Tarapur VI and Tarapur VI) and 2 Outgrowth area (Silchar XI and Tarapur VIII). The continuous development has occurred up to Uttar Krishnapur Pt III Village due to existence of SH 39 on Southern side of Silchar. The continuous development also has occurred due to Mizoram Road in Kanakpur, Uttarkrishnapur I and Uttarkrishnapur II village on South-East part of Silchar. This area is also well connected through

Table 212 Proposed Conurbation Area 2045

Proposed Conurbation Area - 2045				
Sr No.	SMB + OG	CTs	CTs	Villages
1	Silchar Town	Ambicapur - Pt VI	Tarapur - Pt VI	Berenga I
2	Silchar XI	Ambicapur - Pt VIII	Tarapur - Pt VIII	Berenga II
3	Tarapur VIII	Ambicapur - Pt X	Tupkhana Pt I	Berenga III
4		Dudhpatil - Pt V	Uttar Krishnapur Pt I	Berenga IV
5		Dudhpatil - Pt VI	Uttar Krishnapur Pt III	Berenga V
				Kanakpur I
				Kanakpur II
	3	5	5	7
Total no. of villages covered within Proposed Conurbation Area				20

(Source: Consultant Compilation)

12.6.2 EXISTING LAND USE OF CONURBATION AREA

The various industries, the educational and health sectors, trade and commerce and transportation sector are responsible for the city's function. Silchar has been observed to be a multi-functional town having characters of Trade and Commerce cum industries and Institutional Hub.

The existing land use pattern of the conurbation area shows the dominance of residential area. It can be observed that a considerable area is under Public-Semi Public use as this land use consists of the administrative and government buildings, educational institutions, medical institutions, social amenities and public utilities being part of this land use. The maximum developed area is on the Southern side of planning area towards the Ambikapur X and Uttarkrishnapur I Census Town. There is a dense network of roads within the market area. But outside that there are only some linear roads connecting various communes and the nearby States like Manipur, Tripura and Mizoram. There is large parcel of land occupied under the railway station. Commercial areas are mainly located in city centre Town and along the major transportation corridors like NH 306 and SH 39. The area for Recreational Use is practically negligible, since there are few green spaces, parks and gardens. There is a portion of area under agricultural use as paddy field also. The existing land use area on new conurbation area is 24.66 sq.km.

12.6.3 RURAL AREA AND GROWTH CENTRES

The formation mainly happens when the CBD gets saturated with developmental activities and there is hardly any room for further development. Thus, it demonstrates the complex nature of urban areas. In the light of this, four Growth Centers and three Growth Points are identified in Silchar Planning Area since there is a dire need to decentralize the commercial/public semi-public activities towards outskirts of the urban area. Four Growth Centers are proposed in Chengkuri Grant, Uttarkrishnapur III, Berenga Pt 2 and Gossaipur Pt III while the Growth points are proposed in Bali Ghat, Khatal Grant and Bhorakhai Grant.

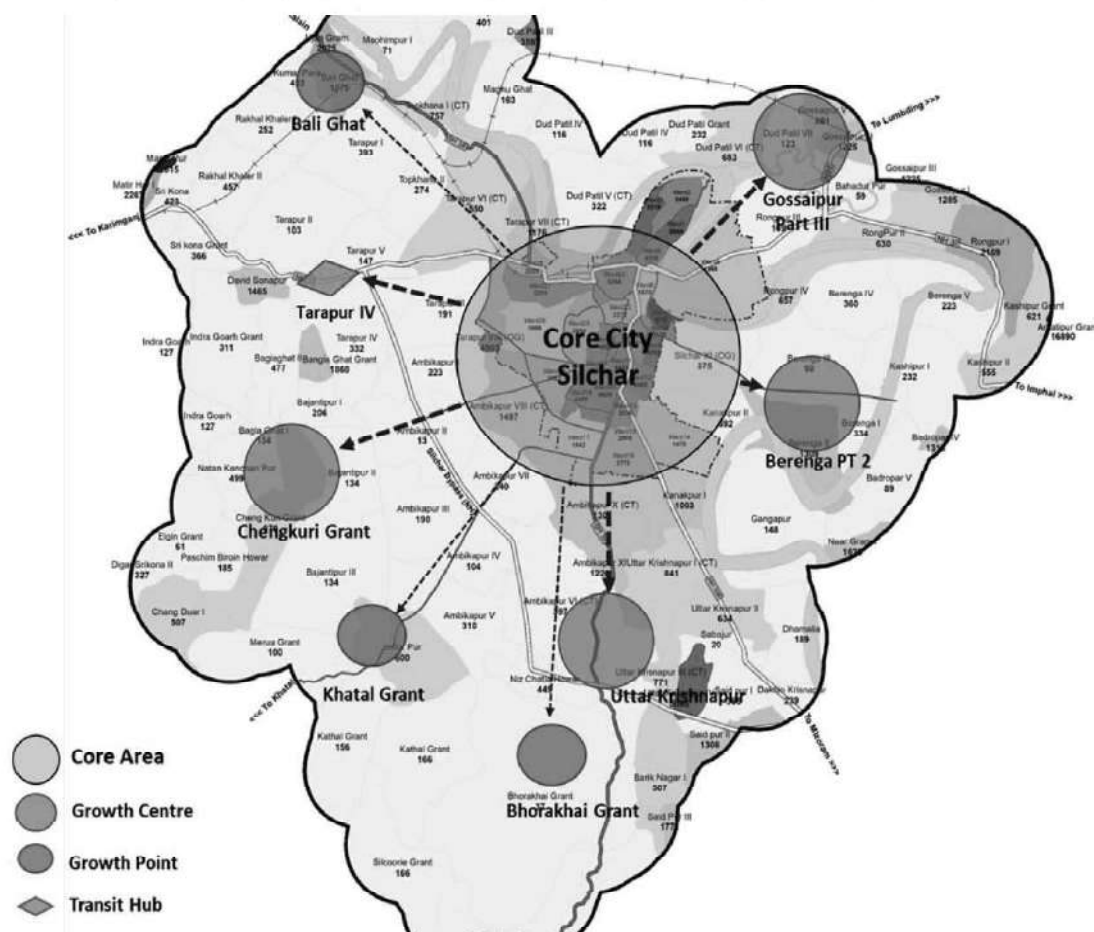


Figure 176 Concept Plan for Silchar Planning Area 2045

12.6.3.1 Uttarkrishnapur Pt III Growth Centre

Uttarkrishnapur III, located in the Southern side of planning area, is known as the Institutional Hub of the area and has very significant institutes like Medical Collage and Polytechnic Institute in the region. Thus, development of this prime location is necessary for preserving the institutional character of land and to increase the employment opportunities in tertiary sector. Moreover, development of the big chunk of flat land will enhance the overall educational character of the SMPA. Thus, Uttarkrishnapur and near by villages are proposed as an institutional growth centre. Other reasons stating the potential of Uttarkrishnapur commune to be developed as a growth centre are mentioned below:

- Uttarkrishnapur is situated 7 Km from Silchar town via road SH 39, this road has ribbon development and potential to develop. Uttarkrishnapur and surrounding villages are also well connected by Newly developed National Highway known as Silchar Bypass Road.
- The presence of Krishnapur Medical Road connecting SH 39 and NH 306 will increase the scope of all round development of region as self-dependent unique entity reflecting institutional character of region.

- Since the SMPA is Non-contiguous area, it is essential to focus on Uttarkrishnapur III centre as self-sustainable development to the extent which will reduce the generation of trips from Uttarkrishnapur to Silchar every day.
- Moreover, the proposed Educational Institutions, Commercial and Residential centres in Uttarkrishnapur and proposed village will accelerate the scope of Uttarkrishnapur to function self-sufficiently.
- The proposal of Sports Complex facilities and Student friendly infrastructures like Hostel facilities, Library, Public Transport System, Road networks consisting separate bicycle tracks will Pull the population from the nearby region which will further strengthen the development.
- Agricultural and Open land in surrounding villages of will act as green zone for Uttarkrishnapur III Growth Centre.
- Uttarkrishnapur will have the impact of proposed ring road and Silchar bypass Highway.

12.6.3.2 Gossaipur PT III Growth Centre

- Gossaipur Pt III is situated around 5 km from Silchar city centre via NH 37 where IOCL (Indian Oil Corporation Ltd.) Industries are functional.
- Development of Gossaipur as Multi Nuclei / Self sustainable center may reduce the traffic flow to Silchar town.
- The presence of already existing industries will attract a greater number of industries. Tool based industries are proposed to be strengthened by capacity building programs.
- Apart from this, Gossaipur Pt III is also well connected by NH 54 and Silchar Airport which will attract and boost the development in the surrounding area. Goods and Fright travelling from North Assam and Southern States to Silchar can interchange the mode of transport from Gossaipur Railway Station.
- Existing Railway line is also passing from the West-Easter side of the Gossaipur Pt III. The Growth centre can take an advantage of this connectivity as well. The existing New Silchar Railway Station over this route will be an important mode of regional transport between Gossaipur and Silchar. The goods and Fright can be utilized for Industrial development purpose. Due to this connectivity, the Growth centre will be further flourished in terms of development.

12.6.3.3 Chengkuri Grant Growth Centre

Chengkuri Grant commune located in the South- West side of planning area is known as the rice bowl of the area and has very fertile chunks of agricultural land. Thus, protection of this prime agricultural land is necessary for preserving the dwindling numbers of agricultural land and to increase the employment opportunities in primary sector. Moreover, preserving the big chunk of agricultural land will enhance the overall environment of the SMPA. Thus, Chengkuri Grant commune is proposed as an agricultural growth centre. Other reasons stating the potential of Chengkuri commune to be developed as a growth center are mentioned below:

- Chengkuri Grant is 4 km from City Centre and village area are consisting beautiful lake and river side area with well-developed crop land. These village is situated along the Ghagra river which is a tributary of barak River, hence there is huge scope for river front development for tourism and recreational are for upcoming settlements.
- Since Chengkuri grant and villages have very fertile agricultural land, to support the agricultural activity like paddy fields, special permission will given in the agricultural zone of Chengmari region, where the Godowns, Agricultural tool and equipment repairing, Cold Storage and allied activities etc. are allowed.
- Since the village has good connectivity through Chengkuri Road and Silchar By pass road, a commercial zone may be proposed along the stretch of Silchar Bypass Highway nearby village.

12.6.3.3 Berenga PT II Growth Centre

Berenga PT II, located in the Eastern side of planning area, is known as the Recreational Hub of the area and has very significant spaces like Mahisa Beel, Kash Maidan Ground located on the bank of Barak River. The picturesque view of Barak River is the main attraction for people to be there to enjoy the moment of relaxation and spent time. Kash maidan is being utilised as playground as well picnic and recreational space by people of surrounding villages. Major portion of the region is flat terrain and that to with less cropping land, hence can be utilized for development of more recreational spots. Thus, development of this prime location is necessary for preserving the natural character of land and to increase the employment opportunities in tertiary sector. Moreover, development of the big chunk of flat land will enhance the overall commercial and residential character of the SMPA. Thus, Berenga PT II and nearby villages are proposed as recreational and residential growth centre. Other reasons stating the potential of Uttarkrishnapur commune to be developed as a growth centre are mentioned below:

It is also viable to propose developed as a hub of Hotel and Service industry to promote the recreational activities like jogging around wetland park and river foot trails to enjoy aesthetics of river and ground courses. Sufficient commercial areas are proposed to facilitate agricultural allied activities. Other reasons stating the potential of Berenga commune to be developed as a growth center are mentioned below:

- The connectivity with Silchar town by Old lakhipur Road and East Bank villages of Barak through newly built bridge over Barak River will accelerate the scope of development for this area.
- Eco village tourism is proposed here as the existing character of the area has the potential to be developed as an Eco village tourism. Moreover, this will act as a livelihood option for the residents of the area.

12.6.4 GROWTH POINTS

The selected points will produce self-sustaining growth. In Silchar Planning Area, three growth points have been identified viz. Balighat, Khatal grant and Bhorakhai Grant.

12.6.4 Balighat Growth point

Balighat Growth Point which is located on the North - West side of the planning area, has the proximity to Silchar Town. It is connected to Silchar by SH - 38 known as Kalain Road. Balighat is having potential to grow as self-sustaining village as it consists of a Market area, Police Station, Schools, Banks, Commercial Centres and enough open land that can be developed for future needs. Thus, it is proposed as a growth point. In this area, activities supporting the educational institutes will be developed. River side development can be proposed in the Balighat for recreational activity to villagers and that will reduce the trip to city for recreation purpose.

12.6.4.2 Khatal Grant Growth point

Khatal Grant Growth Point which is located on the southern side of the planning area, has the proximity to Silchar Bypass through Khatal Road. Its proximity to the proposed trade and commerce belt enables this area with great potential to grow as a growth point attracting investments and being a node for services for the surrounding areas.

12.6.4.3 Bhorakhai Grant Growth point

Bhorakhai Grant Growth Point which is located on the southern side of the planning area, located on SH 39 distancing 9 km from City Centre. Currently, large area (around 150 ha) in Bhorakhai Grant is falling under Institution category which is National Institute of Technology. Availability of land and future population growth requirements encourage the surrounding area to be developed as an institutional for addressing the institutional land requirement to suffice the educational and employment opportunities required for the future population. The strong connectivity with SH 39 will also facilitate the development of industries, as it will provide ease of transportation of goods to adjoining state.

12.6.5 TRANSIT HUB

Tarapur IV is situated on the west entry point to SMPA through major road NH 37. It acts as major transport intersection because ISBT is already situated on the junction point of NH-37 and Silchar Bypass Road. Truck Terminal will be proposed considering the parking demand by goods carrying vehicle in the region.

12.7 RATIONAL FOR THE CONTIGUOUS URBAN DEVELOPABLE AREA

In addition to the regional connectivity of the SMPA with the rest of the seven sister states and the country, existing settlement pattern and urban growth in and around the Silchar city, location of eco-sensitive areas and existing land use have to be taken into consideration while developing concept plan for the proposed SMPA.

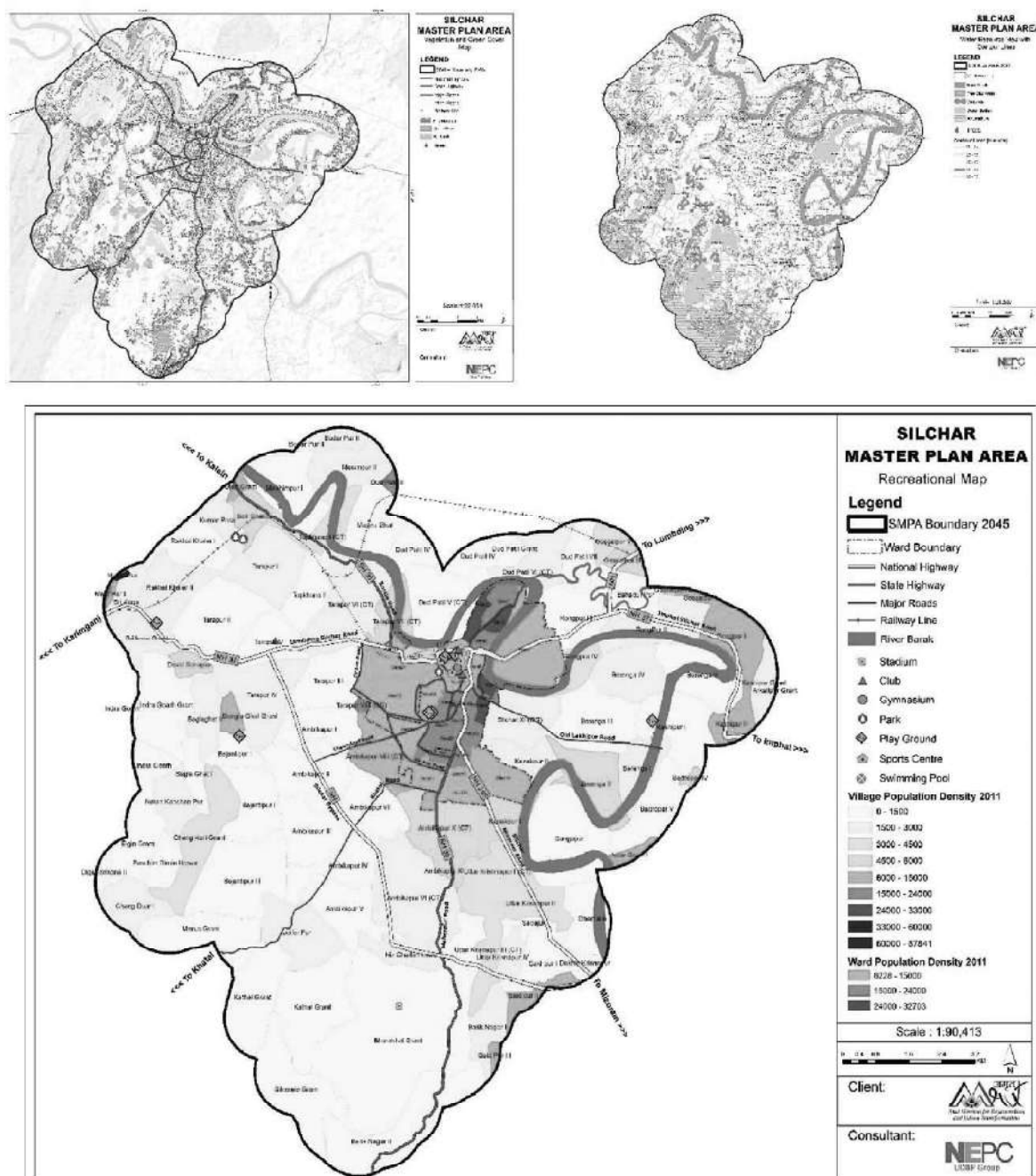


Figure 177 Physiography and Settlements within SMPA

12.7.1 TRANSPORTATION AXIS AND GROWTH PATTERN:

Strategic location of the Silchar city makes it the Regional Center of the Barak Valley region. Number of nation highways that are spread across the Assam State; connect Silchar with the other states of northeast, as well as to the remaining India. In fact, over the last two decades, visibly urban growth has been observed along the transport axis. In addition, location of the central public & semi-public area and the railway stations have influenced the growth pattern of the region. Hence, road network, rail network and location of trade centres is taken in the consideration while developing the alternatives for the Contiguous Urban Developable Area.

Road connectivity has enhanced the urban development of SMB and its surrounding areas. There has been visible growth observed in the East-West direction along the NH-37, towards south along Central Road, in the south-east towards Mizoram along NH-306 and towards SH-39 to some extent. Numbers of new urban centers have gradually emerged along these transportation corridors. In fact, number of urban centers has increased to 10 in 2011 (including Ambikapur VI, Uttarkrishnapur II Census Towns and Tarapur VIII, Sihar XI outgrowth). The maximum growth in the urban centers has been observed in the areas situated on the south of the existing boundary of SMB area, especially in Ambikapur and Uttarkrishnapur, along the SH 39 and NH 306 road.

In addition, the functional interdependency of the first order and second order urban settlements on the Silchar city is also taken in the consideration, while developing the alternatives for the proposed Contiguous Urban Developable Area.

12.7.2 ECO-SENSITIVE AREA AND EXISTING LAND USE:

Other than the urban centres, pattern of the rural settlements in the region is also taken in the consideration, along with the existing economic nodes and eco-sensitive areas. Eco sensitive area, such as hillocks, wetlands, and waterbodies have also taken in the consideration while developing the alternatives for the Contiguous Urban Developable Area. In the context of Silchar whole river tributary system of Barak River and Wetland need to be taken care of. Those areas are restricted, and eco-friendly zones and land uses are proposed accordingly.



12.8 ALTERNATIVES FOR CONTIGUOUS URBAN DEVELOPABLE AREA

Overlaying the existing development pattern with the transportation axis, layer of eco-sensitive areas, and with the existing land use pattern in the region, following options were worked out. Here, presented all the alternatives were discussed with the Govt. officials. Recommendations and objections suggested by the authority have later incorporated in the final concept plan, presented at the end of this chapter. In addition, four gross density alternatives were also developed to exercise the proposed urban developable area. As per URDPFI guidelines, ideal density for urban developable area in plain region should be 100-150 pph (person per hectare). Considering this guideline, the urban developable area should be comprised around between 60 sq.km to 80 sq.km. Below explained the possibilities for Contiguous Urban Developable Area, which comprises area between 65 to 80 sq.km. All presented alternatives were discussed with the authority, and the alternative-1 was finalized after weighting pros and cons of each of them.

Table 213 Considered Gross Density for Developable Area

2045 Population	8,06,933
Alternative-1: 90 pph Density	
Req. Area (sq.km)	89.66
Alternative-2: 100 pph Density	
Req. Area (sq.km)	80.69
Alternative-3: 125 pph Density	
Req. Area (sq.km)	65.55
Alternative-4: 150 pph Density	
Req. Area (sq.km)	53.80
SMPA Are (sq.km)	174
Gross Density (pph)	46
UDPFI Guideline Recommended Density	100-150

12.9 GUIDELINES AND CRITERIA CONSIDERATION

All the above considerations would ensure in the future SMPA a planned spatial structure of the urban settlements and their functional interdependency with each other. Proper zonation and prioritizing the fragile ecology area with least development activities in terms of extensive usage of land including recreational and low-density zone would ensure a balance between developable and open spaces. The transportation axis in the area is also a major consideration, which will help facilitate the region in improving inter and intra connectivity. The final concept plan for the urbanization area of the SMPA hereby have been conceptualized with the approach that other towns around SMB would be developed as Growth Centre and Growth Point within the SMPA. Under AMRUT Mission, 174 sq.km of the proposed SMPA with 130.95 sq.km of the contiguous urban developable area has been selected.

Table 214 Existing Landuse Distribution

Sr. No.	Landuse Type	Area (Sq Km)	Percentage of Developed Area (%)	Percentage of Planning Area (%)
1	Residential	32.29	74.99	18.56
2	Commercial	3.3	7.66	1.90
3	Industrial	0.65	1.51	0.37
4	Mixed	0.06	0.14	0.03
5	Public and Semi Public	3.17	7.36	1.82
6	Public Utilities	0.25	0.58	0.14
7	Recreational	0.27	0.63	0.16
8	Transportation	3.07	7.13	1.76
Total (Developed Land)		43.06	100	24.75
9	Vacant	6.66		3.83
10	Agricultural	57.4		32.99
11	Tree Clad	11.5		6.61
12	Waste Land	16.7		9.60
13	Waterbody	25.15		14.45
14	Wetlands	4.24		2.44
15	Aquaculture	9.3		5.34
Total (Undeveloped Land)		130.95		75.26
Grand Total		174.0		100

Out of total SMPA area, 130.95 sq.km area is the Contiguous Urban Developable Area, which is around 75.26% of the total SMPA area. Out of total Urban undeveloped Area, 66.89 sq.km (38.44%) area is non-developable area that comprise wastelands, waterbodies, tree clad, aquaculture, hillocks, and defence land, while rest of the 61.56% area is available for urban development. Hence, overall, 107 sq.km of land is available for development under Silchar Planning Area 2045.

12.9.1 CRITERIA TAKEN IN CONSIDERATION FOR PROPOSED LAND USE DISTRIBUTION

URDPFI guidelines for the land use distribution (within urban developable area) are taken in consideration for the land use distributions in the SMPA. Apart from the URDPFI guidelines, residential area requirement for housing provision based on the 1.2 FSI (Floor Space Index) and commercial and industrial area requirement based on the employment projection are also taken into the considerations.

12.9.2 GUIDELINES FOR LAND USE DISTRIBUTION

Following table presented the recommendation for land use distribution within the urban developable area by URDPFI Guidelines. The table also show the proposed land use distribution within the proposed urban developable area.

Table 215 Guidelines for Land Use Distribution

Land use Categories	Recommended Share of Land Use
(in percentage of Developable Area)	
Residential	43-48
Commercial / Mixed Use	4-6
Manufacturing/ Industries	7-9
Public and Semi-Public	6-8
Open Space Zone/ Recreation	12-14
Transportation & Communications	10-12
Agriculture, Water Bodies and Special Areas	Balanced
Total	100

(Source: URDPFI Guidelines)

12.9.2.1 Residential Area Requirement Based on Housing Demand

As per the housing projection (refer chapter-5), the SMPA would be required total 1,31,724 housing by 2045. Based on the consideration of 200 sq.mt/housing unit and 1.5 FSI (Floor Space Index), with 25% circulations, and 50% ground coverage, around 21.95 sq.km of additional residential land is required to accommodate the 131 thousand houses within the urban developable area of the proposed SMPA. Overall, around 54.24 sq.km of land will be required for residential settlement in the Planning Area by year 2045. Considering the contiguous area covered by hills, wetlands, water body, agriculture land, eco sensitive area, the proposed residential area is restricted up to 48.01 sq.km. Further Residential cover could be proposed in Phase 2 Planning of SMPA.

Table 216 Residential Area Requirement Based on Housing Demand

Criteria	Year 2045
Total No. of Houses Required	131724
Area Per Housing Unit (sq. meter)	200
Total Residential Unit Area (on sq. meter)	26344800
Assumed Additional 25% Circulation Area Required per unit	
Total Gross Area (Total Residential Plot/Area) (sq.mt)	32931000
Allowed FSI / Average FSI as per GDCR	1.5
Net Area Residential Requirement at Plot Level	21954000
Required Residential Area (sq.km)	21.95
Required Residential Area (ha)	2195
Assumed Allowed (as per GDCR) 50% is Ground Coverage for road and other circulation at	
city level	
Gross Residential Land Requirement (SMPA Level) (sq.mt)	32931000
Required Total Residential Area in SMPA (sq.km)	21.95
Required Residential Area (ha)	2195

12.9.3 CRITERIA TAKEN IN CONSIDERATION FOR LAND USE PROPOSALS

Based on the land suitability and potential analysis, existing land use pattern, and existing situation following criteria were considered while developing land use proposals for the SMPA, especially within the contiguous urban developable area:

- As the region is blessed with Barak Rivers and its tributaries and eco-sensitive area, the area surrounding them should be kept conserve and no or low intensity development should be allowed. No-development buffer varying from 9 meter to 30 meter should be kept surrounding river and wetlands.
- As far as possible low intensity of residential development should be considered in the area that is in the close proximity of the eco- sensitive areas.

- Based on the existing land use pattern, high intensity of mixed use development along the major roads should be considered.
- Transport zone or transport related activities should be kept nearby transport facilities such as Interstate Highway.
- Road network should be designed to have a proper road circulation throughout the Master Plan area, with road hierarchy to provide free movement and to reduce congestion from the existing roads.

12.10 PROPOSED LAND USE PLAN

The total project area includes SMB, Existing SDA Area and additional area added to make Silchar Master Plan Area. Area other than settlements and developmental activities, such as open land (waste land, open / vacant land), wet lands (used for recreational development), Tree covers, Tea estates can be foreseen based on development potential, feasibility, suitability, and consultation with stakeholders.

12.10.1 PROPOSED LAND USE DISTRIBUTION

Considering all above mentioned criteria, below mentioned land use distribution has been proposed. The proposed land use map allocate 52.96% for residential, 15.94% land for commercial and mixed use development, 5.96% land for industrial development, 10.19% for Public and Semi Public, and 7.75% land for open space and recreational purposes out of total developable area. Total 47.90% area will remain undeveloped for the urban agriculture, tea cultivation, water body, wetlands and Aquaculture within SMPA.

Table 217 Existing and Proposed Land Use Distribution of SMPA 2045

Existing - 2020			Proposed - 2045				
Sr. No.	Landuse Category	Area (Sq Km)	% age of Developed Area	% age of Planning Area	Area (Sq Km)	% age of Developable Area	% age of Planning Area
1	Residential	32.29	74.99	18.56	48.01	52.96	27.59
2	Commercial	3.3	7.66	1.90	9.02	9.95	5.18
3	Industrial	0.65	1.51	0.37	5.4	5.96	3.10
4	Mixed	0.06	0.14	0.03	5.02	5.54	2.89
5	Public and Semi Public	3.17	7.36	1.82	9.24	10.19	5.31
6	Public Utilities	0.25	0.58	0.14	0.25	0.28	0.14
7	Recreational	0.27	0.63	0.16	7.03	7.75	4.04
8	Transportation	3.07	7.13	1.76	6.69	7.38	3.84
Total (Developed Land)		43.06	100	24.75	90.66	100	52.10
9	Vacant	18.66		10.72	0.5		0.29
10	Agricultural	57.4		32.99	36.4		20.92
11	Tree clad	11.5		6.61	6.08		3.49
12	Barren Land	0.63		0.36	0.65		0.37
13	Tea Gardens	4.07		2.34	4.07		2.34
14	Waterbody	25.15		14.45	25.15		14.45
15	Wetlands	4.24		2.44	4.24		2.44
16	Aquaculture	9.3		5.34	6.25		3.59
Total (Undeveloped Land)		130.94		75.26	83.34		47.90
Grand Total		174.00		100	174.00		100.00

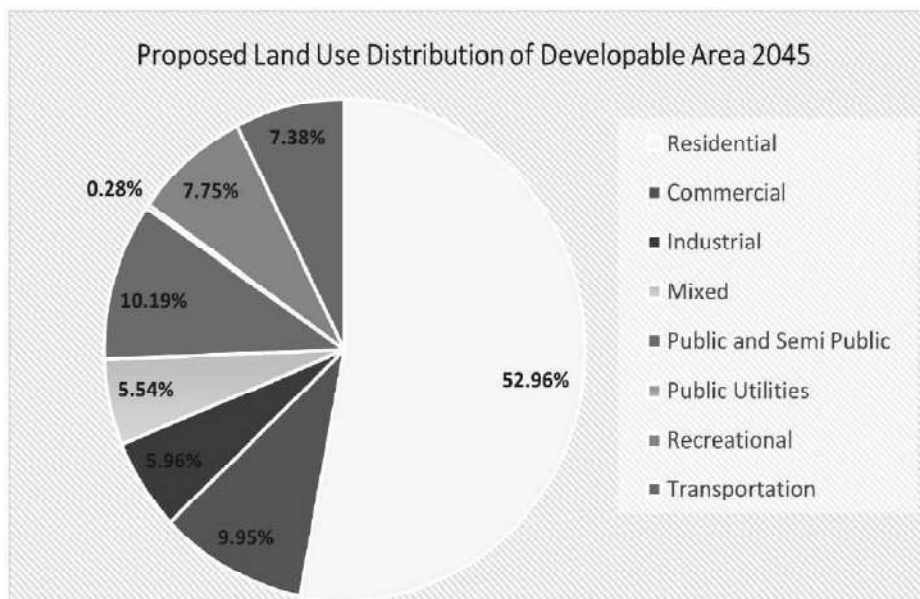


Figure 178 Silchar Developed Planning Area Proposed Land Use Distribution

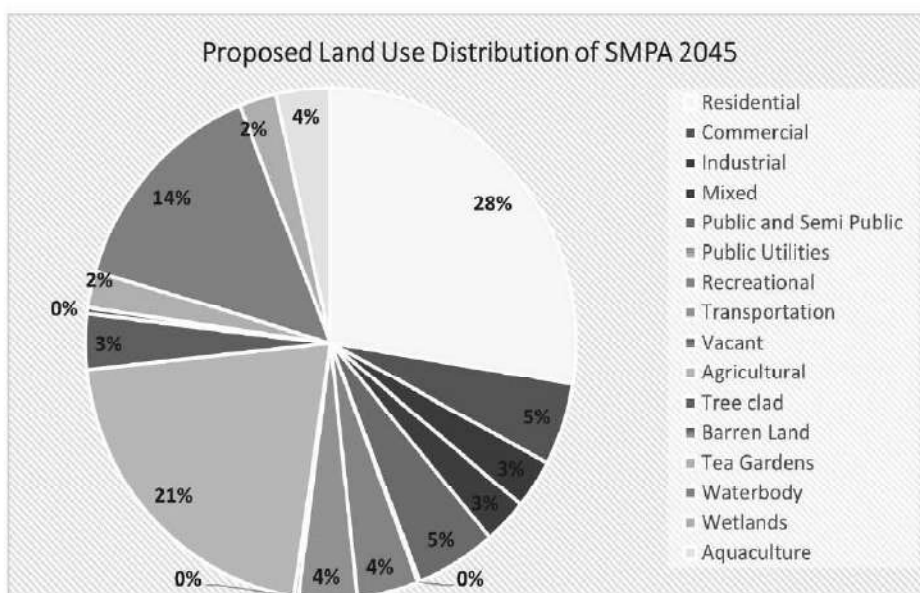


Figure 179 Total Silchar Planning Area Proposed Land Use Distribution

12.10.1.1 Residential Use

For the projected residential population of 8,06,993 persons, the total area required by 2045 for urban development is forecasted to be 9066 hectares, out of which 4801 hectares (52.96% of the developable area) are earmarked for residential development against 3299 hectares available at present. The dedicated area for affordable housing for economical weaker sections is separately identified in the proposed land use plan 2045.

12.10.1.2 Commercial Use

Commercial use has been increased to 902 hectares for the projected year 2045 from the existing 330 hectares which contributes about 9.95 % and 5.18% of the developed area and the total planning area respectively. As the population increases the demand for commercial area increases, hence commercial areas has been planned at the major junction nodes.

12.10.1.3 *Mixed Use*

Mixed use has been increased to 502 hectares for the projected year 2045 from the existing 6 hectares which contributes about 5.54 % and 2.89% of the developed area and the total planning area respectively. As the population increases the demand for mixed use area increases, hence mixed use areas has been planned along all the higher level roads.

12.10.1.4 *Industrial Use*

Industrial use has been increased to 596 hectares for the projected year 2045 from the existing 65 hectares which contributes about 5.96 % and 3.10 % of the developed area and the total planning area respectively.

12.10.1.5 *Public and Semi-Public Use*

Public and Semi-Public Use has been increased to 924 hectares for the projected year 2045 from the existing 317 hectares contributing about 10.19 % and 5.31 % of the developed area and the total planning area respectively.

12.10.1.6 *Recreational Use*

Recreational use has been increased to 703 hectares for the projected year 2045 from the existing 27 hectares.

12.10.1.7 *Transportation Use*

Area under Transportation use has been increased to 738 hectares for the projected year 2045 from the existing 307 hectares.

12.11 FACILITY CENTRE

Based on the hierarchy of order of settlements, facilities are planned. The following are the levels based on hierarchy:

- City level

To facilitate higher order planning, city level facilities are provided.

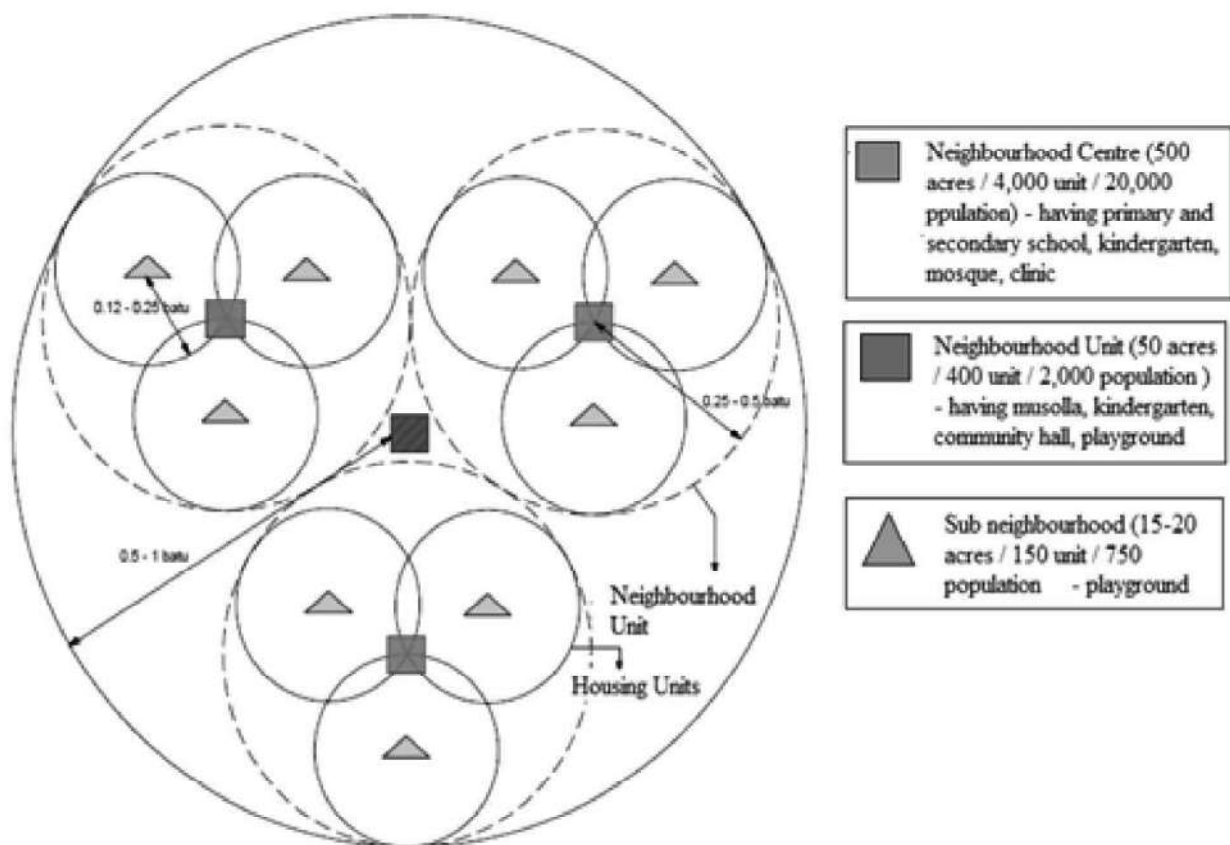
- Neighborhood/ Planning Unit
- Neighborhood into 2 levels

Level I-- 10000-11999

Level II- 12000-15000

- Housing Area Level / Neighborhood level

Grouped to form Housing Area with an average population of 5000 population.



Higher order facilities as general hospital, intermediate hospital, college, integrated schools, and school for handicapped, socio-cultural and recreational club, fire and police stations are provided at the master plan level. Nursery and primary schools, dispensaries are provided at the Neighborhood.

Table 218 Details of Neighbourhood Centres (10 Hectares for 10000 to 12,000 population)

Sr. No.	Facilities	No.	Area per Unit (ha)	Total Area (ha)
1	High Secondary School	1	1.6	1.6
2	Dispensary	1	0.1	0.1
3	Community Hall cum Library	1	0.2	0.2
4	Community Room	2	0.1	0.2
5	Primary School with Playfield	2	0.4	0.8
6	Middle School with play field	1	0.5	0.5
7	Electric Sub Station	1	0.05	0.05
8	Local shopping including Service Centre	1	0.45	0.45
9	Neighbourhood Park	1	0.75	0.75
10	Neighbourhood Play Area	1	0.75	0.75
11	Three-wheeler cum Taxi Stand	1	0.05	0.05
12	Religious Building	1	0.05	0.05
Sub Total -A			100	5.5
13	Transportation and Communication			2.5
Grand Total				8.0

Table 219 Details of Neighbourhood Centres Provisions (10 Hectares for 12001 to 15,000 population)

Sr. No.	Facilities	No.	Area per Unit (ha)	Total Area (ha)
1	High Secondary School	1	1.6	1.6
2	Dispensary	1	0.1	0.1
3	Community Hall cum Library	1	0.2	0.2
4	Community Room	2	0.1	0.2
5	Primary School with Playfield	2	0.4	0.8
6	Middle School with play field	1	0.5	0.5
7	Electric Sub Station	1	0.05	0.05
8	Local shopping including Service Centre	1	0.45	0.45
9	Neighbourhood Park	1	0.75	0.75
10	Neighbourhood Play Area	1	0.75	0.75
11	Three-wheeler cum Taxi Stand	1	0.05	0.05
12	Religious Building	1	0.05	0.05
Sub Total -A			100	5.50
13	Housing Area			2.00
Sub Total -B				7.50
14	Transportation and Communication			2.50
Grand Total				10.00

12.12 ZONING REGULATIONS

In order to promote public health, safety and the general social welfare of the community, it is necessary to apply reasonable limitation on the use of land and buildings. This is to ensure that the most appropriate economical and healthy development of the city takes place in accordance with the land use plan. For this purpose, the City is divided into a number of use zones, such as residential, commercial, industrial, public and semi-public, etc. Each zone has its own regulations as the same set of regulations cannot be applied to the entire town.

Zoning protects residential area from the harmful invasions of commercial and industrial uses and at the same time promotes the orderly development of industrial and commercial areas. By regulation the spacing of buildings, adequate light, air, protection from fire etc. can be provided. It prevents overcrowding in buildings and land thus ensures adequate facilities and services.

Zoning is not retrospective. It does not prohibit the uses of land and buildings that are lawfully established prior to the coming into effect of the zoning regulations. If these uses are contrary to the newly proposed uses, they are termed as non-conforming uses and are gradually eliminated over years without inflicting unreasonable hardship upon the property owners.

The zoning regulations and their enforcement are a major tool in keeping the land uses pattern of the Comprehensive Master Plan. It has been stated that the consultants have adopted the UDPFI guidelines with minor modification. However while detailing out the use permissibility, etc in various categories all care has been taken to integrate:

- (A) Assam Building Byelaws 2014 for Notified Urban Areas of Assam (Other than Guwahati)
- (B) "Guwahati Building Construction Byelaws" (Planning and Building Standards), Regulation 2020;
- (B) URDPFI Guidelines.

This formulated guideline may adopt other provision of the regulation towards intensity of development and built form guidelines, etc.

1. In the Silchar Master Planning Area (SMPA), various use zones namely Residential, Commercial, Mixed Use, Industrial, Public and Semi- Public, Recreational, Transportation, Agricultural, Protective and Undevelopable Areas having their location as indicated in the Comprehensive Master Plan shall be regulated and guided. Except or otherwise provided, no structure or land here inafter shall be erected, recreated or altered unless its use is in conformity with the following regulations.
2. All existing places of worship, temples, churches, mosques, burial and cremation ground etc. shall be exempted from being treated as nonconforming uses, provided that continuance of such uses are not detrimental to the locality as decided by the Authority from time to time.
3. All non-conforming uses of land and buildings shall be discontinued by the owner and the modified uses shall be made to confirm to the land use of the development plan in force within six months of the Regulations coming in force.

12.12.1 RESIDENTIAL ZONE (R)

Residential Zone is pure residential area in which major commercial and industrial activities are not allowed, however some for day-to-day needs of shopping uses should be allowed. In addition, a comprehensive range of community facilities, including schools, medical facilities, neighborhood retail and open space are allowed. Total 48.01 sq.km (52.96%) of area is earmarked for Residential Zone in the proposed land use plan. Further, the zone is classified into three categories viz. Residential Zone-1, Residential Zone-2, and Residential Zone-3. Refer the GDCR (General Development Control Regulations) for allowed activities and permissible floor space for each activity, in all zones.

As conurbation area will be facing the higher pressure of development, ample residential area is proposed in order to accommodate the future expansion which will take place in the future.

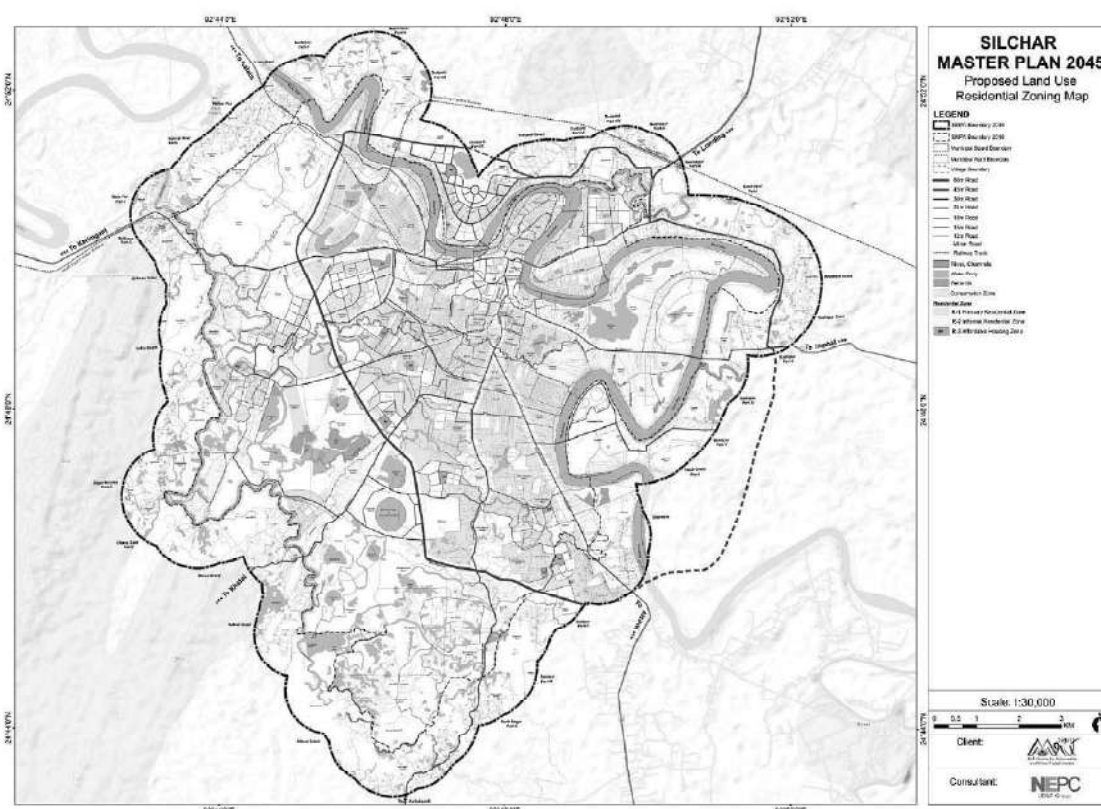


Figure 180 Proposed Residential Zone Map, SMP 2045

12.12.1.1 Primary Residential Zone-1 (R1)

Total 28.66 (31.61%) sq.km of land is allocated for R1 zoning. Higher intensity residential development is allowed in this zone. No other than residential uses are allowed in this zone; however, housing will be developed with a comprehensive range of community facilities, including schools, medical facilities, neighborhood retail and open space.

12.12.1.2 Unplanned Residential Zone-2 (R2)

The residential area that is proposed outside the proposed Contiguous Urban Developable Area are earmarked as a Residential Zone-2. Medium to low intensity residential development is allowed in this zone. Total 18.76 (20.69%) sq.km of area is earmarked as R2 zone.

12.12.1.3 Residential Affordable Housing Zone-3 (R3)

This zone is an overlay Zone that permits predominantly residential development for providing Affordable Housing along with ancillary commercial uses Affordable Housing as a use is permitted in all zones except all types of industrial Zones, Restricted Zone, Residential 3 and agriculture Zone. It shall also be permitted as a use in all other categories. Affordable Housing is predominantly Residential development for providing Affordable Housing of dwelling units up to 80 sq.mts along with ancillary commercial use up to 10% of the total utilized FSI. Projects under Residential Affordable Housing (R3) shall utilize a minimum FSI of 1.8 and maximum 2.7 to avail the benefits of "RAH". Total 0.58 (0.66%) sq.km of area is earmarked as R3 zone.

12.12.2 COMMERCIAL ZONE (C)

Total 9.02 (9.95%) sq.km of area has earmarked in the proposed land use plan as Commercial Zone for commercial land uses. This zone allows a range of commercial uses including retail shops, offices, small-scale warehouses, and the hospitality industry that includes hotels and entertainment venues.

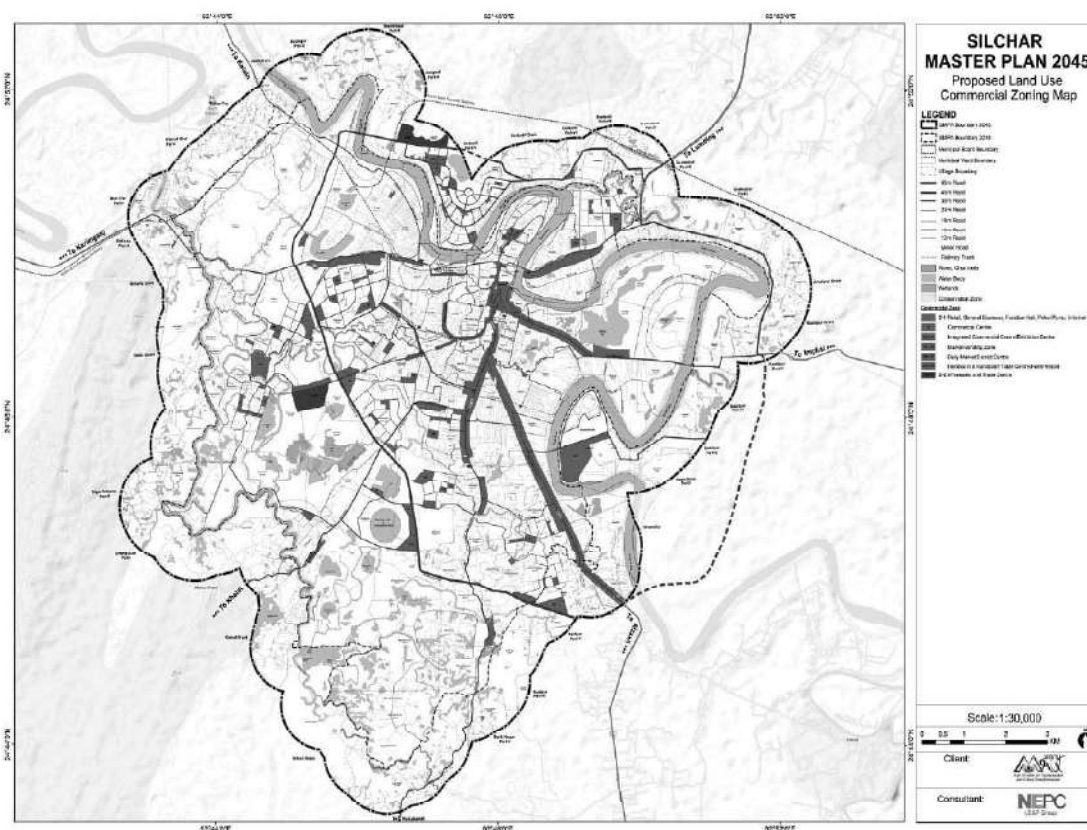


Figure 181 Proposed Commercial Zone Map, SMP 2045

Further, the zone is classified in two categories viz. Commercial-1 and Commercial-2.

C1: Retail Shopping Zone, General Business and Commercial District/ Centres, Regulated markets, Service Sector, Regulated/ Informal/ Weekly markets

C2: Wholesale, Go-downs, Warehousing

Existing industrial activities will be allowed to continue as non-confirming use but no new industrial related activities would be allowed in the earmarked commercial zone. Refer the GDCR (General Development Control Regulations) for allowed activities and permissible floor space for each activity, in all zones.

Retail Space:

- Neighborhood and Community Level Retail Space- will be located near residential area that will include kiosks, shops, and community markets; where day-to-day needs of consumers, particularly food shopping and convenience goods will be accommodated.
- District and City Level- Larger commercial center and intermediate commercial centres, which includes the prime retail space represented by malls and high quality shopping space

Office Space:

Offices space will be required primarily for the indirect employment generated because of direct employment in the base industries and economic sectors. The following sectors will require office space:

- Transport and Storage
- Construction and Infrastructure
- Public Administration
- Utility Companies and Institutional bodies
- Banking and financial services
- IT based company and tele communication

It is assumed that the wholesale, retail sectors, banking and financial sectors will operate out of their own premises.

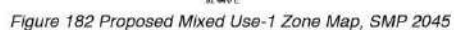
12.12.3 MIXED USE ZONE (MU)

Total 5.02 (5.54%) sq.km area is earmarked as Mixed Use Land Use in the PLU. Further, this land use is classified into two zones viz Mixed Use-1 and Mixed Use-2.

12.12.3.1 Mixed Use-1 (MU-1)

Total 3.74 sq.km of area is proposed under this land use zone. Major portion of this zone is located along the Silchar Bypass road and small of it along NH 37 (Karimganj- Silchar Road) that is passing from Srikona to Silchar Sadar Railway Station area. 100 meter of influence area on both sides of these roads are proposed as a Mixed Use -1 zone.

Another earmarked 100 meter influence area on portions of Proposed Ring Road at Dudhpatil and along NH-54 (From Madhurapul Point towards Gossaipur) as a Mixed Use-1 zone. In the proposed Mixed Use-1 zone 80% of the FSI will be available for commercial/institutional/ PSP purposes, while the rest of the 20% FSI will be for residential purpose. Existing industrial allowed as non-confirming use but no new industrial activities will be permitted Refer the GDCR (General Development Control Regulations) for allowed activities and permissible floor space for each activity.



Mixed Use-2 (MU 2)



Total 1.28 sq.km of area is proposed in SMPA as a Mixed Use-2 where 40% area will be available for commercial/institutional/ PSP purposes, while the rest of the 60% will be for residential purpose. If for any reason, the 40% area allotted for commercial development will not fully or partly developed for commercial activities then the area can be used for residential purpose; however, if the residential area is not fully developed then allotted residential area cannot be used for commercial purpose. Locations of the Mixed Use Zone-2 is as per the Proposed Land Use Map. Refer the GDCR (General Development Control Regulations) for allowed activities and permissible floor space for each activity. However, Existing industrial allowed but no new industrial activities will be permitted.

12.12.4 PUBLIC AND SEMI-PUBLIC ZONE (PS)

Silchar is home for many educational and health institutes like Silchar Medical Collage, National Institute of Technology, Silchar Polytechnic, Assam university, Silchar Womens College and Govt. Primary, Secondary and Higher Secondary Schools. It is considered a favorite destination among students in the Barak Velly part of Assam. This has led to many educational and health institutes being established within the planning area leading to an increase in percentage of land falling under the public and

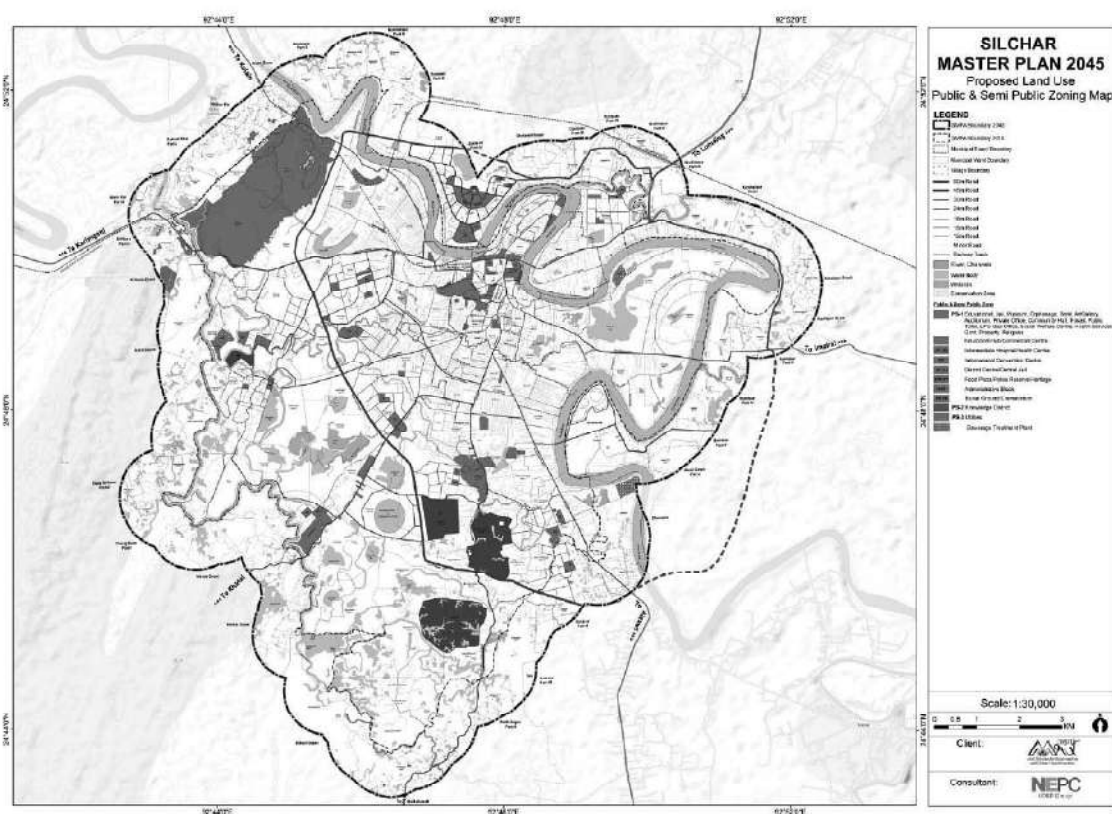


Figure 184 Proposed Public & Semi-Public Zone Map, SMP 2045

semi-public category against the prescribed limit of URDPFI guidelines for P&SP land use.

Further, the zone is classified in three categories viz. PS-1, PS-2, PS-3 and PS-4.

PS-1: Govt./Semi Govt. / Public Offices Govt. Land use, Police Headquarter/ Station. Police line, Educational and Research, Medical and Health, Socio Cultural and Religious (incl. Cremation, Cemetery and Burial Grounds), Cantonment/ Battalion Area

PS-2: Knowledge District / University

PS-3: Utilities and Services (STP, SWTP, Sub Stations, Communication, etc.)

Total 9.24 sq.km of area is earmarked as a Public and Semi-Public zone in the proposed land use map. Health, Educational, Cultural, Government Buildings, sports and open space facilities will be allowed in this zone. Refer the GDCR (General Development Control Regulations) for permissible activities and permissible floor space for each activity.

12.12.5 INDUSTRIAL ZONE (I)

To create a conducive environment for development, Industrial Zone is created. Total 5.4 sq.km of the Industrial land use zone has demarcated at different locations like, Gossaipur V, Maghu Ghat, Tarapur Pt. III, IV, V, Ambikapur Pt. II and IV in the proposed land use plan.

The Industrial zone is further classified in two categories viz. I-1, and I-2.

I-1: Service, Manufacturing and Light Industry

I-2: Extensive and Heavy Industry

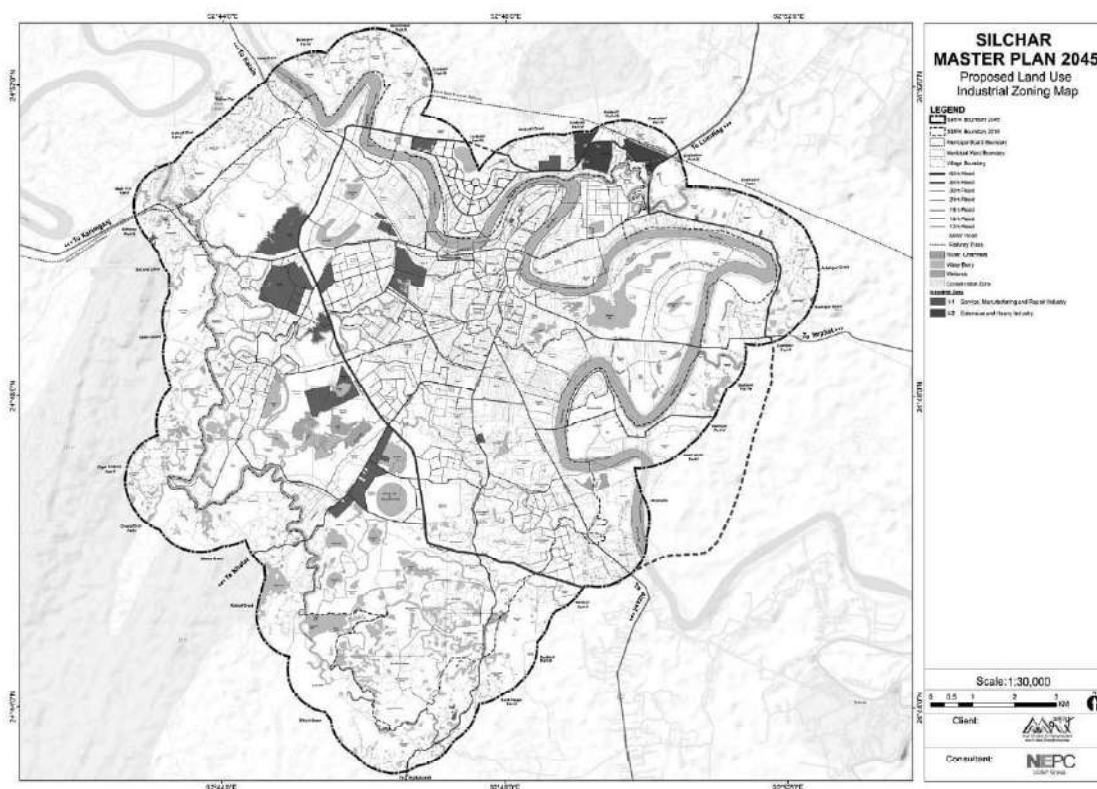


Figure 185 Proposed Industrial Zone Map, SMP 2045

The distribution of the main industrial zones is shown in the map. Only industrial activities are allowed in the demarcated industrial land use in the PLU map. In addition, small workshops and businesses can be allowed on the edge of the main industrial. However, existing land uses within the proposed industrial zone will allow as non-confirming use until redevelopment of such land parcels. Refer the GDCR (General Development Control Regulations) for permissible activities and permissible floor space for each activity.

Total 7.03 sq.km of area earmarked as Open Space and Recreational Land Use, where recreational activities, parks, riverfront development, playground, theme parks, and exhibition grounds can be allowed. Refer the GDCR (General Development Control Regulations) for permissible activities and permissible floor space for each activity.

12.12.7 URBAN AGRICULTURE ZONE

With the rapid growth and expansion of cities, agricultural lands starts declining. Thus, this issue is meticulously dealt with, by providing dedicated agricultural lands in the planning area. The agricultural lands are protected till possible extent. Except conurbation area, in rest of the area agricultural land are proposed to be preserved. Moreover, every large chunks of Tea garden lands have been kept intact in different village.

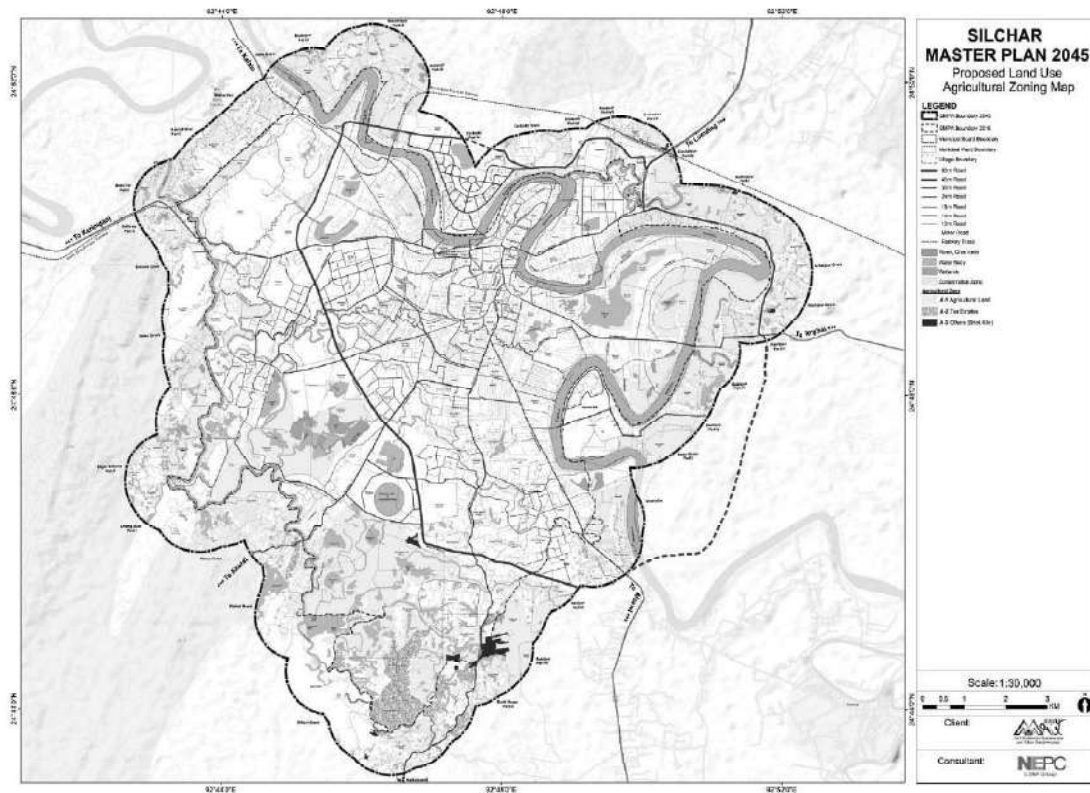


Figure 187 Proposed Agriculture Zone Map, SMP 2045

Total 36.4 sq.km of area earmarked as Urban Agriculture Zone, around the identified 'Contiguous Urban developable Area' in the proposed Land Use Plan. Urban agriculture⁴ land use is divided into three parts,

A-1: Agriculture Land, Urban farm

A-2: Tea Estates

A-3: Poultry Farm, Brick Kiln, Dairy Farm and Barren Land

Activities such as animal husbandry, aquaculture, agro-forestry, and horticulture will be allowed in this land use area. Refer the GDCR (General Development Control Regulations) for permissible activities and permissible floor space for each activity. be allowed in this land use area. Refer the GDCR (General Development Control Regulations) for permissible activities and permissible floor space for each activity.

⁴United Nations Development Program (1996) defines urban agriculture as an activity that produces, processes and markets food and other products, on land and water in urban and peri-urban areas, applying intensive production methods and reusing natural resources and urban wastes to yield a diversity of crops and livestock. Urban agriculture in addition can also involve anima.

Figure 188 Proposed Conservation Zone Map, SMP 2045

12.12.9 Transportation Zone

Total 7.38 sq.km of area is specifically earmarked as a Transportation Zone for which permissible facilities as classified below-

- ISBT
- Railways
- Multimodal Transit Hub
- Integrated Freight Corridor
- Parking
- Logistics Hubs (Bus Terminals and Truck Terminals)
- Tele-Communication

Refer the GDCR (General Development Control Regulations) for permissible activities and permissible floor space for each activity.

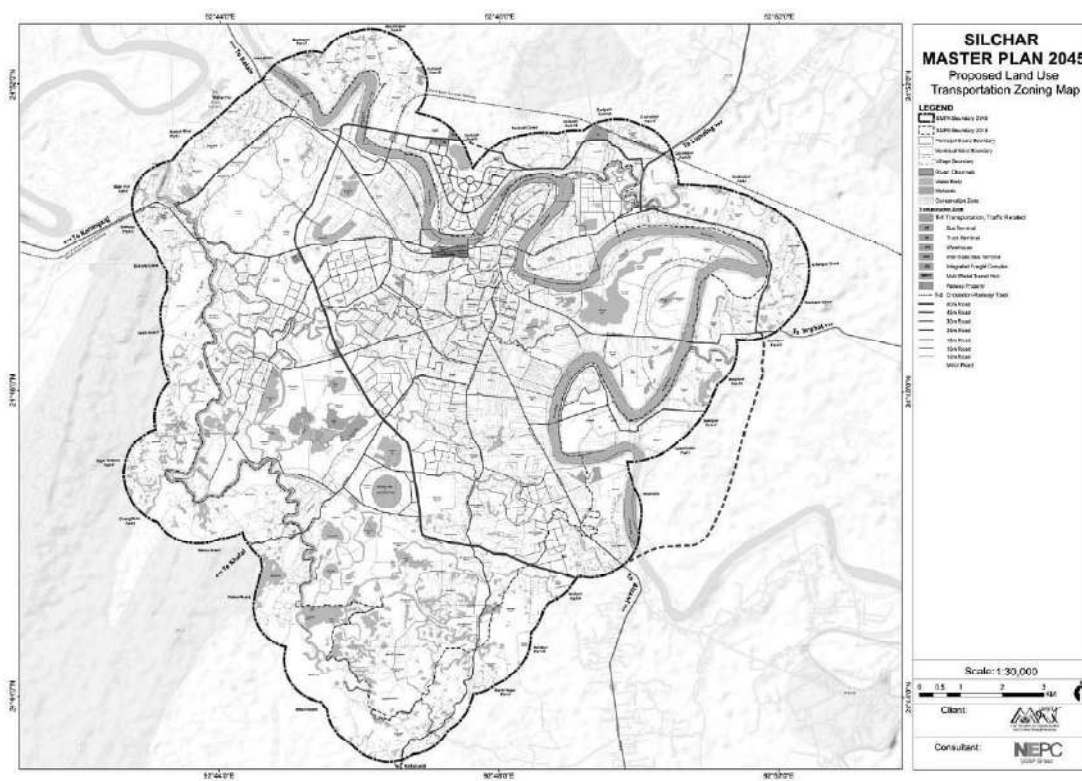


Figure 189 Proposed Transportation Zone Map, SMP 2045

12.12.10 ROAD

The proposed road system together with new linkage is designed to have a proper road circulation throughout the Master Plan area. Road hierarchy is proposed to provide free movement within the Master Plan area. Ring Road has been identified within SMPA to avoid entering the regional traffic into the city center, and will help in relieving the existing congestion in and around the SMB area. NH 37 that is entering SMPA from Srikona in west, will bifurcate the traffic in North and South direction after merging on proposed ring road at intersect of Silchar bypass and Ramnagar Road (NH 37) to restrict entry of HMTVs to City Centre. Silchar bypass road as a part of proposed ring road will be carrying the regional traffic that does not intend to enter the city center and will generally travel towards Northern City Centres and towns like Hailakandi, Aizwal and Sonai. Northern semi circle portion of ring road starting from ISBT and heading towards dudhpatil and Rangpur will carry the regional traffic who intend to travel towards Lakhimpur, Haflong and Laming city centres.

12.12.10.1 Proposed Hierarchy of Roads

The proposed Master plan for Silchar exhibits a definitive hierarchy in its structure. The proposed road network would increase connectivity within the region, simultaneously helping alleviate traffic problems. The proposed road network is in radial and arterial pattern with hierarchy in structure. The concept is to integrate the existing road of SMB with proposed road in SMPA. The proposed hierarchies of roads are 60mt, 45mt, 30mt, 24mt, and 15mt wide.

60mt Wide Roads:

This is the 1st order road in the proposed road network. Silchar bypass road from ISBT to Kashipur falling within and out side SMPA is proposed for 60mt wide. This proposed new National highway is the main trunk of the proposed road network, as it is connect the entire region with the rest of the India and other states of the seven sisters.

45mt Wide Roads:

This is the 2nd order road in the proposed ring road. The northern portion of Ring road connecting Tupkhana Pt.1, Masimpur Pt.1, Maghughat, Dudhpatil Pt.4-5, Rangpur Pt. 3 and 4 of contiguous urban area would be of 45mt wide. The 45 mt wide road will through the traffic coming from NH-37(West) towards NH-54, SH-38 and NH-37 (East) without entering to the core city centre area.

These roads are designed as a radial road. Access to land uses on one or both sides of the radial roads can be provided through a service road in order to separate the low-speed local traffic from the higher speed traffic. On road, there will also be provision for public transport. This would normally be on the same side of the road as the mixed commercial/residential areas.

Pocket Major Road 30mt Wide:

The proposed 30mt wide roads are third order in the hierarchy of the proposed road network. These roads are working as collector roads and at the nodes; they are well connected with the 45mt wide roads.

The collector road network intercepts traffic from inside the urban areas and feed it into the arterial roads. The proposed cross section of these roads comprises a divided dual 2-lane carriageway with a pedestrian footpaths and a narrow median.

Pocket Minor Road 24mt Wide:

The proposed 24mt wide roads are fourth order in the hierarchy. These routes are originated from with the 45mt or 30mt wide roads and are designed as collector roads. Roads with restricted truck access indicate priority routes for all light traffic (with a limited access for the service trucks during non-peak hours of the day). These routes are intended to provide safe access of the passenger traffic to the surrounding residential areas.

Pocket Minor Road 15mt Wide:

The proposed 15mt wide roads are fifth order in the hierarchy in the urban developable area. These routes are originated from with the 30mt or 24mt wide roads and are designed as collector roads, within SMP area.

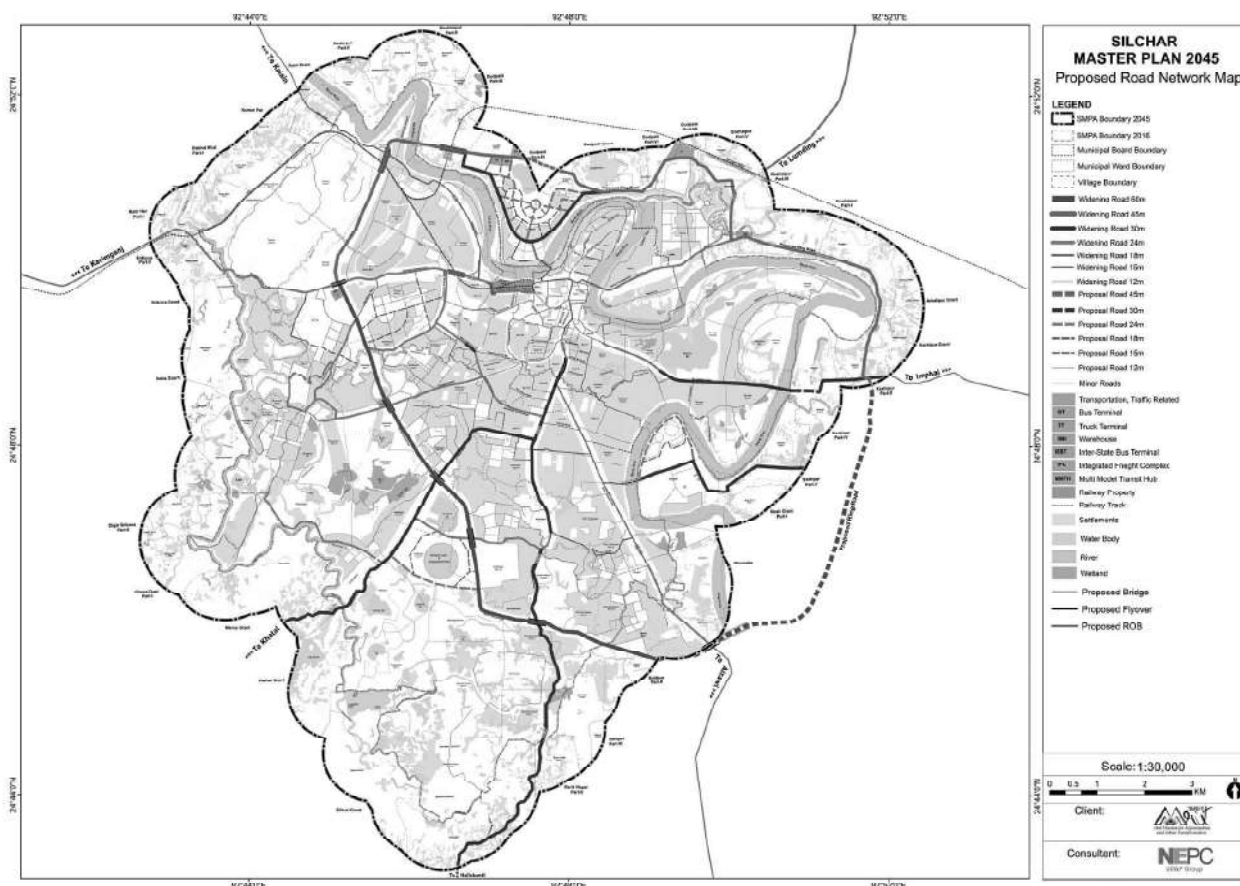


Figure 190 Proposed Transport Network Map, SMP 2045

Each Planning Zone can be put to such use(s) as detailed out in the Master Plan. The proposed Land use Plan indicates the location of broad uses and major facility areas. The requirements of these facilities are subject to necessary modifications when the detailed Zonal Development Plans are conceived. Therefore, the purpose of Zonal/Sub-zonal byelaws and regulations is not to stop the urban development activities in the Planning Area but to serve as broad policy framework for the promotion of planned development. The Master Plan proposes building activity within the prescribed Local Area limits should be controlled and guided by following set of regulations as spelt out in the below table.

The aim of enforcing the regulations is to achieve a desirable development pattern and structure with good quality of life. In order to ensure complete harmony between land uses, town has been divided into various Use Zones including Residential, Commercial, Industrial, Recreational, Public & Semi-Public, Transport & Communication, Agriculture, Plantation, Water bodies etc. However, in enforcing Master Plan proposals the regulations have been made efficient to avoid inconvenience to public. Mixed land use concept has also been adopted and prescribed which shall need approval of Government. The adoption of mixed land use concept is to enhance functionality of the uses.

12.13 SPACE STANDARDS & DEVELOPMENT AND DESIGN CONTROLS

Space standards are fundamental to obtain the basic objective of Zoning Regulations to achieve desirable pattern of development in each Use Zone. Strict enforcement is needed to achieve articulated urban development as envisaged in the Master Plan.

Table 220 Spatial Norms and Standards

Sl. No.	Description	Standard Prescribed	Plot Area/ Unit (HA)
A	Educational Facilities		
1	Pre-Primary School	1 for 2,500 – 4,000 Population	0.08
2	Primary School (including a playfield)	500 students / 4,000 Population	0.4
3	Middle School (including a playfield)	1000 students or 1 for 7,500 Population	0.6
4	Middle School with Hostel	1000 students or 1 for 7,500 Population	0.75
5	Higher Secondary School (IX-XII)	1000 students or 1 for 10,000 Population	1.6
6	Higher Secondary School (IX-XII) with Hostel	1000 students or 1 for 1,00,000 Population	2
7	Integrated School (Class I-XII) with Hostel	1000 students or 1 for 1,00,000 Population	3.9
8	Integrated School (Class I-XII) without Hostel	1500 students or 1 for 1,00,000 Population	3.5
9	School for Handicapped (including a playfield)	400 students / 45,000 Population	0.5
10	College (including a hostel and playfield)	Students 1000-15000 or 1.25 Lac Population	4
11	University campus without residential quarters	-	10
12	New University Campus with residential quarters	-	30
13	Industrial Training Institute (ITI)	500 students / 10 Lac Population	2
14	Polytechnic	400 students / 10 Lac Population	2
15	New Engineering College	1500-1700 Students	30
16	Medical College with Specialized General Hospital	1500-1700 Students	15
B	Health Care Facilities		
17	Health Unit / Dispensary	1 for 15,000 Population	0.1
18	Nursing Home / Maternity Centre	30 Beds / 1 per 45,000 Population	0.25
19	Polyclinic with some observation beds	1 for 1 Lac Population	0.25
20	General Hospital (300-500 beds) with residential accommodation	1 for 1 to 2.5 Lac Population	6
21	Intermediate Hospital with residential accommodation	100-200 Beds / 1 Lac Population	3.7
22	Intermediate Hospital	80-100 Beds / 1 Lac Population	1
C	Socio-Cultural Facilities		
23	Community Room	1 per 5,000 Population	0.1
24	Community Hall and Library or Multi- purpose Hall	1 per 15,000 Population	0.2
25	Recreational Club	1 per 15,000 Population	0.3
26	Recreational Club	1 per 50,000 Population	0.5
27	Recreational Club	1 for 1 Lac Population	1
28	Music, Dance & Drama Centre	1 for 1 Lac Population	0.2
29	Club Houses	1 for 1 Lac Population	1
30	Museum & Art Gallery with Parking	-	1
31	Community Centre with Hall and Library etc	1 for 15,000 Population	0.3
32	Meditation and Spiritual Centre	1 for 50,000 Population	0.5

33	Botanical / Zoological Park	1 for 1 Lac Population	5
34	Exhibition Area (s)	1 for 1 to 10 Lac Population	10
35	Cinema / Theatre	1 for 1 Lac Population	0.5
36	Stadia / Sports Centre/ Complex	1 for 1 Lac Population	8
37	Mini-Play Field	1 for 2,500 Population	0.75
38	Play Field	1 for 15,000 Population	1.5
39	Religious Place / Structure	1 for 2,000 Population (for all community)	0.2
40	Religious Place / Structure	1 for 10,000 Population (for all community)	0.5
41	Graveyards	1 for 20,000 Population	2
42	Cremation Ground	1 for 50,000 Population	0.5
D	Distribution Services		
43	Post and Telegraph Office	1 for 1.5 Lac Population	0.4
44	Post Office	1 for 40,000 Population	-
45	Telephone Exchange	-	0.2
46	Petrol Pump	1 per 225 ha of Gross Residential Density	0.2
47	Petrol Pump	1 per 40 ha of gross Industrial Density	0.2
48	Milk Booth	1 for 5,000 Population	-
49	LPG Godown	1 for 50,000 Population	0.2
50	LPG Plant with Bottling Facility	-	1
51	Electrical Sub Station of 11 KV	1 for 15,000 Population	-
52	Electrical Sub Station 66 KV	1 for 1 Lac Population	-
E	Police and Fire Services		
53	Police Station	1 for 90,000 Population	1.5
54	Police Post	1 for 40,000 Population	0.2
55	Fire Station	1 for 90,000 Population	1.5
F	Slaughter House		
56	Slaughter House	1 for 1 Lac Population	0.4
57	Abattoir	1 for 1 Lac Population	1

13 IMPLEMENTATION AND MONITORING

13.1 PROVISIONS GIVEN IN THE ASSAM TOWN & COUNTRY PLANNING ACT 1959

In order of secure planned development of Silchar Planning Area, it will be important that proposals defined in the GIS Based Master Plan of Silchar are implemented on the ground in letter and spirit. The concept defined in the Comprehensive Master Plan for securing rational development shall not be achieved unless it is adequately supported through a well-defined mechanism for ensuring its proper implementation.

Use and Development of land

As per Section 13 of the Act, no person can use or permit or carry out any development in the Planning area without conformity with the Master Plan after coming into operation of the Master Plan. No development can be taken up by an individual and Department of the Government without the permission of the Competent Authority for which an application shall be made accompanied by documents and fee, as may be prescribed under Section 13(2). Act provides for regulating all constructions / development undertaken by any person including stopping of illegal construction, imposing penalties, demolition of buildings etc.

Acquisition and disposal of land

Section 32 of the Act provides for acquisition of land as per the provisions under Land Acquisition Act, 1894 for public purpose. The Planning Authority may, at any time, and for the purposes of a Master Plan acquire any land with the sanction of the Government. Land is acquired by the Government and then transferred to the Authority for development on payment of compensation.

Levy of Betterment Fee

As per Section 41 of the Act, Every property which has increased in value due to its inclusion within an area under a plan or a scheme or due to the execution of such schemes shall be charged with a betterment fee and such change or development is capable of yielding a better income to the owner, the Planning Authority may levy a not exceeding 1/3 rd of the estimated increase in the value of the land or building for permitting such change in use or development.

13.2 SALIENT FEATURES DEVELOPMENT CONTROL REGULATIONS

For better implementation of the GIS Based Master Plan, it is to be controlled through Development Control Regulations. To derive the Development Control Regulations for Silchar Planning Area, Gross Residential Density is worked out.

As per URDPFI Guidelines 2015, the gross density for developed area of Medium Town (Population having 1 lakh to 5 lakh) in Plain Areas should be 100-150 PPH. As per Census 2011, the population of Silchar Planning Area is 471709 with total area of 174 sq.km. The gross density of the planning area is 27 PPH. The Gross Residential Density is 146 PPH which is nearly matching with the URDPFI guidelines 2015. Considering projected population for year 2045 as 8.06 lakhs (mentioned in Chapter-2) for the planning area, there can be of more growth and anticipated compared to the growth rate of the previous decades. The reasons for that are cited in Chapter 2, Section11- Population Projection 2045. For year 2045, projected population is coming to be 8.06 lakhs. By considering projected population of 5.51 lakhs, the proposed gross residential density is worked out to be 168 PPH.

13.3 POLICY FRAMEWORK RELATED ACTIONS

It will be important to focus on following to achieve the effective implementation besides promoting planned development of the local area. This should include:

- Putting in place appropriate order of manpower in Town Planning and Engineering division within the Authority
- Creating a dedicated Enforcement Wing for implementing the Master Plan
- Creating Land Bank – creation of inventory of Government Land through which status of Government land can be monitored (buying & selling of Government Land).
- Looking at new options for generating resources for funding the development work for making urban development self – financing.
- Involving Private, Corporate and Cooperative Sectors as major partners in the Planning, Development & Implementation of Master Plan through an investor friendly framework.
- Creating awareness among people about the role and importance of Comprehensive Master plan including its major provisions and schemes to make local citizens as partners in the development process and in providing appropriate quality of life.
- Creating a High-Powered Board for coordinating the activities of various departments operating within the planning area and define Policy Framework for implementation of GIS Based Master Plan 2045.
- Maintaining a GIS based system for updating database and monitoring of Master Plan implementation. (Master Plan 2045 is already prepared on GIS platform which has to be updated time to time)
- Phasing of development and developing trunk infrastructure including major roads, water supply, sewerage, drainage or electricity etc. as per priority.
- Formulation of the annual plan and identification of projects for implementation within the framework of approved Master plan - adopting Project Based Approach.
- Transforming the role of Government/Authority from 'Provider to Enabler' and devising innovative methods of resource mobilization.
- Making use of different central and state government schemes to finance major proposals in the SMP 2045.

13.4 LAND POOLING AND PLOT RECONSTITUTION FOR PLAN IMPLEMENTATION

Based on the pattern followed in states of Maharashtra and Gujarat, SMP 2045 advocated the use of land pooling and reconstitution mechanism to manage, service, reconstitute the private land and promote planned development. The mechanism involves development without acquisition of land involving land owners as equitable interests in the development process. The entire development cost is generated out of part sharing of increase in land values due to planned development of the area. Land is earmarked for roads, open spaces, parks, play grounds and amenities including healthcare and education. Planning Authority also gets land from the scheme, which is disposed off by the designated agencies to raise resources to meet the development cost and pay the cost of land, which is used for public purpose, etc. Land owners get full compensation of land, which is used by public agencies and shares the cost of development. The scheme is prepared in consultation with land owners, which minimize the chances of conflict between land owners and the Planning Authority. Development agency on its parts gets land for roads, open spaces, amenities, etc. free of cost without resorting to land acquisition. The developed land which is made available to land owners can be disposed off by him in the open market at a negotiated price fetching him higher returns.

Land Pooling and Redistribution Scheme (Town Planning Scheme)

It is a land development technique undertaken by the land owners who pool their land to receive a good layout, following a procedure involving:

- Notifying an area for Town Planning Scheme.
- Pooling of land of different land owners to the Authority.
- Preparing a detailed scheme as per the provision of Master Plan indicating the original and final plots, roads, open spaces, amenities, involving the land owners.
- Redistribution of final plots after charging betterment contribution and paying compensation for the land used for public purposes, transferred to the local authority.
- The role of development authority remains most critical in order to finalise the scheme by involving land owners, preparing layout plans, getting it approved from land owners and the state government and ensuring execution of scheme. In the entire process land is developed as per the plan involving no acquisition of land. This is the major feature which distinguishes Town Planning Scheme from other modes of land assembly like bulk acquisition or bulk acquisition of selected land for public amenities. After the Town Planning Scheme is finalized, entire land earmarked for public purposes involving roads, open spaces, amenities, etc. vests with the local authority without paying any compensation and is generally called "Land Acquisition without tears". It makes land owners also happy because they lose only part of their land used for public purposes and get the remaining land after planning with freedom of disposal in urban markets. Compensation is also paid to the land owners for the land which is used for public purpose. However, the scheme has been found to popular in large cities with adequate demand of land. Scheme has one drawback that it takes considerable time for finalization. However, the model adopted by state of Gujarat for speedier framing of T. P. Scheme could be used for formulation of T. P. Scheme on time bound basis. This method can be considered for adoption by Silchar Planning Authority after detailed study of various aspects of the scheme and legal framework required to make these schemes a reality. It would also require placement of trained manpower to be put in place to frame and finalise the T.P. Scheme.

Spatial planning of any urban area tends to increase the land value of that area. A further increase takes place when the actual development works start. It's a common experience that ULBs excepting a few municipal corporations lag badly in executing the development works which mainly consist of basic civic services. This is mainly on account of the paucity of funds. Since the spatial planning and the development works tend to increase the land prices, it was thought necessary to mop up a part of the incremental increase in prices for the purpose of carrying of the developmental work. Traditionally this has been sought to be achieved by levying charges at two stages termed betterment charges and development charges. As soon as the spatial planning is finalised, the authorities responsible for spatial planning levies a charge termed as betterment charges.

Unfortunately, this charge, however, does not lead to any net income for the planning authority. This is because the entire rationale seems to be individual owners of plot are going to surrender land owned by them for the development works and therefore, are entitled to some compensation. The cost of carrying on the planning work will be offset. Therefore virtually there will be no net income to the planning authority.

Anticipated expenditure for laying of roads and various other civic services. Part of the increment of land value on account of this is sought to be mocked up by levying the development charges. However, actual amount generated falls much below the expenditure for levying the services. Secondly, this charge is levied and collected when a person owning a plot comes for actual development on that plot. Here also this hardly serves the purpose of effectively providing the fund backup needed for actually executing development jobs.

The government has therefore in various states has made provision for a part of the land under development to devolve on the spatial planning authority. The idea is that funds generated by the sale of the devolved land

would be helping the institutions to carry on the development works, if need be, by borrowing funds from the public finance institutions by putting the sum as margin money.

In case the state government agrees to resorting to land pooling methodology for executing town planning, the suitable provisions can be made for reservation of land for the planning authority for generating funds needed for actual development. In this context, as is being done in Maharashtra and Gujarat.

13.5 PHASING AND COSTING

The successful implementation of a Master Plan is depending on the availability of resources with the implementation authority and the concerned department. The availability of funds sets the guidelines for the development for various proposed projects of the planning area. The different proposals for Silchar Master Plan (SMP) have been drawn up for achievement over the period up to 2045 have given a broad estimate of investment to be undertaken.

This is an indicative investment plan, it would be imperative to find out sources of enhanced capital finances to be able to carry out the required investment. Further, it has been a common phenomenon that many of the capital expenditure has not been sustained properly leading the delivery of services to suffer. Therefore, sustenance of capital expenditure in terms of operation and maintenance of assets created becomes all the more important and this force for identification of different revenue generating options.

Phasing is done for the development to take place incrementally over the period of time, according to the financial resources available. Initial projects are to be selected in such a manner that they act as catalysts for economic growth of the city. Generally, it includes projects such as knowledge cities, business and high tech parks and commercial centres etc. These will cause huge inflow of people to the city for education and employment.

For Silchar Planning area, the implementation of the proposals is divided into three phases; short term, Medium term and long term. The proposals to be implemented in these phases are described below:

13.5.1 SECTOR-WISE INVESTMENT PROPOSAL

The sector wise investment requirement for the implementation of various projects of Silchar Master Plan is detailed in table below.

Table 221 Sector Wise Investment for Silchar Planning Area 2045

Sl. No.	Location	Project Name	Total Project Cost (in lac.)	Cost in Phase I (2021-30) (lac.)	Cost in Phase II (2031-40) (lac.)	Cost in Phase III (2041-45) (lac.)
Urban Development						
1	Core area of Silchar Town	Urban Renewal of Core Old Areas of Silchar Town	500	250	250	-
2	Core area of Silchar Town	Development of Heritage Buildings of Silchar Town	300	150	150	
3	Distributed in Town	Rehabilitation of Slums dwellers along Barak river and on Water Bodies located in Planning Area	2500	1000	1000	500
4	Silchar Planning Area	Green area around Industrial area and Wetlands	150	100	50	
5	Tarapur Pt. VI	Neighbourhood Centre at Tarapur Pt. VI	620		620	

6	Dudhpatil Pt. V	Neighbourhood centre at Dudhpatil Pt. V	818		818	
7	Rangpur Pt. III	Neighbourhood Centre at Rangpur Pt. III	880			880
8	Tarapur Pt. V	Neighbourhood centre at Tarapur Pt. V	890		890	
9	Ambikapur Pt. I	Neighbourhood Centre at Ambikapur Pt. I	930	930		
10	Ambikapur Pt. I	Neighbourhood Centre at Ambikapur Pt. I	650		650	
11	Ambikapur Pt. VIII	Neighbourhood centre at Ambikapur Pt. VIII	860	860		
12	Ambikapur Pt. II	Neighbourhood Centre at Ambikapur Pt. II	790		790	
13	Ambikapur Pt. X	Neighbourhood centre at Ambikapur Pt. X	680	680		
14	Ambikapur Pt. VI	Neighbourhood centre at Ambikapur Pt. VI	700		700	
15	Uttar Krishnapur Pt. I	Neighbourhood centre at Uttar Krishnapur Pt. I	690			690
16	Sabajpur	Neighbourhood centre at Sabajpur	870		870	
17	Uttar Krishnapur Pt. III	Neighbourhood centre at Uttar Krishnapur Pt. III	1100		1100	
18	Bagalaghat Grant Pt. I	Neighbourhood centre at Bagalaghat Grant Pt. I	700			700
18	Ambikapur Pt. V	Neighbourhood centre at Ambikapur Pt. V	620			620
19	Saidpur Pt. I	Neighbourhood centre at Saidpur Pt. I	670			670
20	Tarapur Pt. VI	Affordable Housing (1 Ha)	3000		3000	
21	Dudhpatil Pt. V	Affordable Housing (2 Ha)	2000	2000		
22	Dudhpatil Pt. V	Affordable Housing (1.5 Ha)	1500		1500	
23	Rangpur Pt. III	Affordable Housing (8 Ha)	8000	4000	4000	
24	Tarapur Pt. V	Affordable Housing (6 Ha)	6000	4000	2000	
25	Ambikapur Pt. I	Affordable Housing (5 Ha)	5000	4000	1000	
26	Ambikapur Pt. VIII	Affordable Housing (6 Ha)	6000	2000	4000	
27	Ambikapur Pt. VII	Affordable Housing (6 Ha)	6000	3000	3000	
28	Bagalaghat Grant Pt. I	Affordable Housing (7 Ha)	7000			7000
29	Ambikapur Pt. VI	Affordable Housing (4 Ha)	4000		4000	
30	Uttar Krishnapur Pt. II	Affordable Housing (4 Ha)	4000			4000
31	Uttar Krishnapur Pt. IV	Affordable Housing (4 Ha)	4000			4000
32	Saidpur Pt. I	Affordable Housing (8 Ha)	8000		4000	4000
Public-Semi Public Places						
33	Dudhpatil Pt. V	Administrative Block (30 ha)	30000	20000	10000	
34	Dudhpatil Pt. V	International Convention Centre (ICC) (5 ha)	12000	8000	4000	
35	Ambikapur Pt. VI	Knowledge District (35)	20000	5000	10000	5000
Water Supply System						
36	Silchar Planning Area (SMPA)	Preparation of DPR for Water Supply System for Silchar Planning Area	100	100		

37	Existing Silchar Town	Water Supply System sanctioned under AMRUT	6200	4000	2200	
38	Existing Silchar Development Authority Area	Improvement of Water Supply System of Silchar	23000	8000	8000	7000
39	Silchar Planning Area	Hand Pump water Distribution System	1000	500	500	
Power						
40	Existing Silchar Municipal Area	Renovation and modernization of 33/11 KV and 11 KV / 440 V sub- stations	400	200	200	
41	Existing Silchar Development Authority Area	Installation of new transformers and capacity augmentation of existing transformers	6500	3000	2000	1500
42	Existing Silchar Development Authority Area	Metering of All connections	200	100	50	50
43	Existing Silchar Development Authority Area	Installation of a HVDS (High Voltage Distribution System)	500	250	150	100
44	Silchar Planning Area 2045	Preparation of DPR for Power Supply System for Silchar Planning Area 2045	100	100		
Sewerage System						
45	Silchar Planning Area 2045	Preparation of DPR for Sewerage System for Silchar Planning Area	200	200		
46	Silchar Planning Area 2045	Laying of Sewer Network for Planning Area	26000	10000	10000	6000
47	Bagala Ghat Grant Pt. 1	Construction of STP (30 MLD) on 10 Hectare of Land	800		500	300
48	Berenga Pt. IV	Construction of STP (50 MLD) on 15 Hectare of Land	1000	600	400	
49	Dhamalia	Construction of STP (35 MLD) on 8 Hectare of Land	680		350	330
Solid Waste Management						
50	Silchar Planning Area	Improvement and Modernization of Solid Waste Collection, Transportation and Disposal System of Silchar	250	250		
51	Silchar Planning Area	Development of Solid Waste Treatment Plant of 200 TPD Capacity	15000	7500	7500	
Drainage System						
52	Silchar Planning Area 2045	Preparation of DPR for Drainage System for Silchar Planning Area	100	100		
53	Silchar Town	Cleaning and maintenance of existing main drains	1000	500	500	
54	Silchar Planning Area 2045	Laying of Roadside drains in new proposed areas within Silchar Planning Area	3000	1000	1000	1000
55	Silchar Town	Construction and Improvement of Storm Water Drainage System	15000	7500	5000	2500
56	Silchar Planning Area 2045	Slope protection, Improvement, Construction, Repair & Restoration	100	100		

Water Bodies						
57	Silchar Planning Area 2045	Repair and Renovation of Water Bodies in Planning Area	1000	500	500	
58	Silchar Planning Area 2045	Development of Green Cover around all water bodies	500	250	250	
59	Silchar Planning Area 2045	Development of Silchar River Front on Barak River	8000	5000	3000	
60	Silchar Planning Area	Development of Barak river with joggers track as recreational zone	200	100	100	
61	Ramnagar	Development of Anuabill as recreational area	1000	500	500	
Traffic and Transportation						
62	Silchar Town	Repair and Renovation of Existing Road Network of Silchar Town	2500	1500	1000	
63	Rangpur Pt.II	Development of Moinarband Railway Station	500	250	250	
64	Tarapur Pt. IV	Augmentation of ISBT	500	500		
65	Dudhpatil Pt. IV	Development of Intermediate Freight Complex (60 Ha)	300	100	200	
66	Rangpur Pt. II	Development of Bus Terminal (8 Ha)	200	200		
67	Dudhpatil Pt. IV	Development of Bus Terminal (4 Ha)	90		90	
68	Ambikapur Pt. II	Development of Bus Terminal (5 Ha)	100		50	50
69	Dudhpatil Pt. IV	Development of Truck Terminal (5 Ha)	150	75	75	
70	Silchar Planning Area 2045	Preparation of DPR on City Mobility Plan	50	50		
71	Silchar Planning Area 2045	Construction of City Ring Road	37000	17000	10000	10000
72	Silchar Planning Area	Improvement of Traffic Signal facility in Silchar Planning Area	600	300	200	100
73	Silchar Planning Area	Augmentation of City Bus Fleet	1000	400	400	200
74	Silchar Planning Area	Construction of Non-motorised Transport facilities (Footpaths & Cycle Tracks & Cycle Parking)	1600	600	500	500
75	Rajpath Road, Sadarghat	Construction of Multi level cum Daily Market	400	400		
76	Janigunj Road, Near Court	Construction of Multi level cum Daily Market	300	300		
77	Sadarghar Junction, Near Divisional Forest Office	Construction of Multi level cum Daily Market	500	500		
78	Itkhola Road	Construction of Multi level cum Daily Market	300		300	
79	Kalain Road- NH 37 Junction	Construction of Multi level cum Daily Market	400		400	
80	Ward 26	Construction of Multi level cum Daily Market	300	300		
81	Ward 17	Construction of Multi level cum Daily Market	400	400		

82	Ward 23	Construction of Multi level cum Daily Market	300	300		
83	Ward 19	Construction of Multi level cum Daily Market	300	300		
84	Ambikapur Pt. 3, Chengkuri Road	Construction of Multi level cum Daily Market	300		300	
85	Ambikapur Pt. X, Hailakandi Road	Construction of Multi level cum Daily Market	400		400	
86	Bhorakhai Grant Pt.2	Construction of Multi level cum Daily Market	300	300		
87	Srikona	Construction of Multi level cum Daily Market	400		400	
88	Kalain Road Railway line	Construction of ROB on Sadar Railway Station line for Ring Road	1000	1000		
89	Maghughat	Construction of ROB on railway line near Mazumdar Bridge	1000	500	500	
90	Tarapur VII, Ramnagar Road	Construction of ROB on NH 37 on Railway line near Ramnagar	1000	1000		
91	Ukil Bazar Pt. 1	Construction of Parallel ROB on Sadar Railway Track	1500	1500		
92	NH-37, Silchar Bypass Road	Development of ISBT Fly over on Karimganj-Silchar Road	900	900		
93	Silchar Bypass- Chengkuri Road	Development of Fly over on Silchar Bypass Road	900		900	
94	Silchar Bypass- Khatal Road	Development of Fly over on Silchar Bypass Road	1000	800	200	
95	Silchar Bypass- Hailakandi Road (SH 39)	Development of Fly over on Silchar Bypass Road	1000	1000		
96	Silchar Bypass- Atal Basti Road	Development of Fly over on Silchar Bypass Road	800			800
97	Silchar Bypass- NH 306	Development of Fly over on Silchar Bypass Road	1000	1000		
98	Sonabari Chat	Development of River Bridge on Barak River	900		900	
99	Uttar Krishnapur Pt. I	Development of River Bridge on Barak River	1000	1000		
100	Tupkhana Pt. I	Development of River Bridge on Barak River	1000		1000	
Commercial						
101	Tarapur Pt. V	Development of Commercial/ District Centre	800	300	500	
102	Ambikapur Pt. II	Development of Commercial/ District Centre	800		800	
103	Dudhpatil Pt. IV	Development of Commercial/ District Centre	700	300	400	
104	Rangpur Pt. III	Development of Commercial/ District Centre	700		300	400
105	Ambikapur Pt. VI	Development of Commercial/ District Centre	650	200	450	
106	Uttar Krishnapur Pt. IV	Development of Commercial/ District Centre	700		400	300
107	Bhajantipur Pt. I	Development of Integrated Commercial Centre	1000		500	500

108	No. 2 Bhurbhuri Gaon	Development of Integrated Commercial Centre	800		500	300
109	Dudhpatil Pt. IV	Development of Wholesale and Trade Centre (10 Ha)	1200	600	600	
110	Ambikapur Pt. II	Development of Wholesale and Trade Centre (10 Ha)	1000	1000		
111	Ambikapur Pt. VI	Development of Handicraft Trade Centre (8 Ha)	600	600		
Social Infrastructure						
112	Dudhpatil Pt. V	Development of Multi-Specialist Intermediate District Hospital	900		900	
113	Ambikapur Pt. VII	Development of Multi-Specialist Intermediate District Hospital	600		300	300
114	Ward 11	Development of Subash Nagar Graveyard	250	250		
115	Malugram	Development of Santiban Graveyard	30		30	
116	Ward 11	Improvement of Civil Hospital	200	200		
117	Bhajantipur Pt. I	Development of Knowledge District	2000			2000
118	Dudhpatil Pt. V	Development of Knowledge District	2500		1500	1000
Recreational						
119	Dudhpatil Pt. IV	Development of Botanical Garden	300	100	200	
120	Gangapur	Development of District Sport Centre cum Complex	80000	40000	40000	
121	Ward 24	Augmentation and Beautification of Gandhi Baug	700	700		
122	Ambikapur Pt. II	Development of Indoor Stadium and Sport Centre	20000	5000	5000	10000
123	Bhajantipur Pt. II	Development of District Level Park	1000		500	500
124	Uttar Krishnapur Pt. I	Development of District Level Park	1000	500	500	
125	Gangapur	Development of Cultural Complex	7000	3000	4000	
126	Gangapur	Development of Theme/ Amusement Park	12000	5000	5000	2000
127	Ambikapur Pt. V	Development of Lake Front cum Amusement Park (Gorakuri Bill)	3000	1000	2000	
128	Bhajantipur Pt. I	Development of Lake Front (Changkuri Bill)	1000		500	500
129	Dhamalia	Development of Open Organized Spaces	200		100	100
130	Ambikapur Pt. VI	Development of Open Organized Spaces	100		100	
131	Silchar Planning Area and Surrounding Region	Development of Heritage Circuit (Development of Infrastructure at Kachari Fort, Circuit House, District Session Judge Court Building, Normal School, Chief Judicial Magistrate Building, Judge Bungalow, Civil Surgeon Bungalow, in Silchar Planning Area)	500	200	300	

Industrial Area						
132	Dudhpatil Pt. VI-VII	Development of Industrial Estate – I	15000	5000	5000	5000
133	Dudhpatil Pt. IV	Development of Industrial Estate – II	5000	2000	3000	
134	Tarapur Pt. III-IV	Development of Industrial Estate – III	12000	6000	6000	
135	Ambikapur Pt. – II	Development of Industrial Estate – IV	4000	2000	2000	

(Source: Consultant Compilation)

13.5.2 TOTAL INVESTMENT PROPOSAL

The Master Plan of Silchar Planning Area will require a total public and private sector investment of approx. Rs 4946.68 crores till horizon year 2045. The summation of all the costs of sectoral level plans provide the total estimate as detailed in Table below.

Table 222 Summation of Sectoral Investment Plan for Silchar Planning Area

Sl. No.	Sector	Approx. cost (Crore)	Phase -1 (2021-30)	Phase -2 (2031-40)	Phase -3 (2041-45)
1	Traffic and Transportation	621.90	324.75	180.65	116.50
2	Physical Infrastructure	1011.30	440.00	383.50	187.80
3	Social Infrastructure	64.80	4.50	27.30	33.00
4	Commercial Development	89.50	30.00	44.50	15.00
5	Recreational	1268.00	555.00	582.00	131.00
6	Environment and Ecology	107.00	63.50	43.50	0
7	Mixed use/Neighbourhood centres	804.18	229.70	343.88	230.60
8	Public-Semi Public	620.00	330.00	240.00	50.00
9	Industrial	360.00	150.00	160.00	50.00
Total		4946.68	2127.45	2005.33	813.9

(Source: Consultant Compilation)

13.6 RESOURCE MOBILISATION

Availability of adequate resources is essential for the successful implementation of the Master Plan. This demands rejuvenation of urban centers to attract more and more investments in those areas. Implementation of the Master Plan requires huge amount of financial resources and it is impossible for the Planning Authority to bear such huge amount of money. There are certain fiscal mechanisms that can be adopted for mobilizing the financial resources.

Land remains the critical element of urban development and accordingly can be leveraged to raise resources for urban development and implementation of the SMP. Land values remains closely linked with the use to which the land is put and permission is granted to use the land in urban context. From the experiences, it is found that the only mechanism to fund the urban infrastructure is to undertake and promote planned development either by the parastatal agencies or by the private, cooperative, corporate sectors. Both these mechanisms can be leveraged by Development Authority to raise resources/ implement the SMP provided the legal framework permits the same and authorizes the Authority to regulate it.